

The Electragist

TRADE MARK REG. U.S. PAT. OFFICE

Vol. 24, No. 11

Association of Electragists
INTERNATIONAL

SEPTEMBER, 1925

\$204,861,600.00 worth of new schools need



"RED SPOT"



The Standard
"Red Spot"
hanger with
stem construc-
tion is popular.

The 1849 new schools contracted for during the first six months of 1925 will be ready for lighting equipment this Fall. Many are ready now. Go after this business, pocket extra profit, by selling them

WAKEFIELD HANGERS

Over 100 live lighting contractors have succeeded in having Wakefield "Red Spot" Hangers adopted as standard school lighting equipment in their towns. This means that nothing else can be sold there. You have the same opportunity in your town. We'll tell you how, and help you.

Write for bulletin "Better Lighting of Schools" which has already helped many other contractors get school business.

The F. W. Wakefield Brass Co.
Vermilion, Ohio

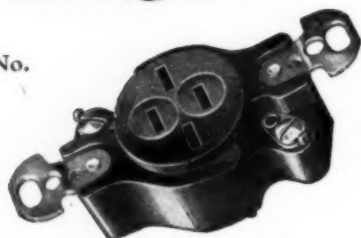
Pacific Coast Representative: Geo. A. Gray & Co., San Francisco and Los Angeles

The 1925 Receptacle

Will increase your
1925 Profits



Cat. No.
L-5



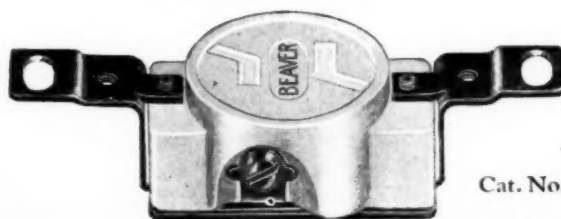
Cat. No. L-1

Nos. L-1 and L-2 are black composition, with highly polished faces. Depressions around slots facilitate entering plugs. Very handsome. For de luxe installations — at "budget cost."



Cat. No. L-2

Sound Design Sturdy Construction
Easy to Wire

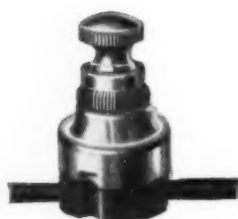


Cat. No. L-7

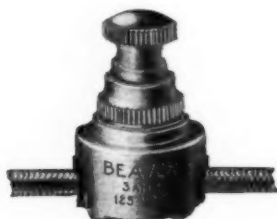
Shallowest on the market. Large binding screws don't drop out.

Of elephant gray ceramic with the face black glazed. Chippings never show white as the gray goes all the way through. Mechanically similar to our famous composition receptacle No. L-5

Beavers are National Code Standard approved by
the Board of Underwriters



Cat. No. A-3



Cat. No. A-9



Cat. No. A-7



Cat. No. A-11

*Canopy switches for all places,
positions, purposes*

Our canopy switches have more overload capacity, greater endurance, due to extreme care in manufacturing. Our mechanisms are made with watchmaker's precision.

And the prices are right.
Why sell inferior articles?

Wire your jobber now—or our nearest Representative

BEAVER

MACHINE & TOOL CO., 625 North 3rd St., Newark, N. J.

THE ELECTRAGIST, September, 1925, Vol. 24, No. 11, \$2.00 per year, 20 cents a copy. Published monthly at 100 Liberty Street, Utica, N. Y. Association of Electragists—International, 15 West 37th St., New York, N. Y. Entered as second class matter September 1, 1919, at the Post Office at Utica, N. Y., under the act of March 3, 1879.

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The Electragist

(The National Electrical Contractor and The Electrical Contractor-Dealer)

Official Journal of the
Association of Electragists—International

Vol. 24

SEPTEMBER, 1925

No. 11



The Glad Hand Committee—Official Welcomers of every Electragist Convention

A Welcome for All At West Baden

EVERY electrical contractor and dealer, be he an electragist or not, will be welcome at the twenty-fifth annual convention of the Association of Electragists, International, to be held at West Baden Springs, Ind., September 23, 24 and 25.

The program which was announced last month is comprehensive and in every instance an effort has been made to obtain the very best speakers possible on that particular subject. The principal address will be made by J. H. Trumbull, governor of Connecticut, president of the Trumbull Electric Manufacturing Company and former contractor.

Transportation at the reduced rates of fare and a half for the round trip may be had by those traveling by rail.

Hotel accommodations may be had at a cost to suit almost anyone's tastes either at the West Baden Springs Hotel or at other near by places under the same management.

One of the features of the convention will be the exhibit of electrical materials by the manufacturers. Each day definite times are set apart for visiting the exhibits which will be in them-



W. A. Straith, Who Is Planning to Fly to West Baden from Winnipeg

selves an education well worth traveling to the convention to see.

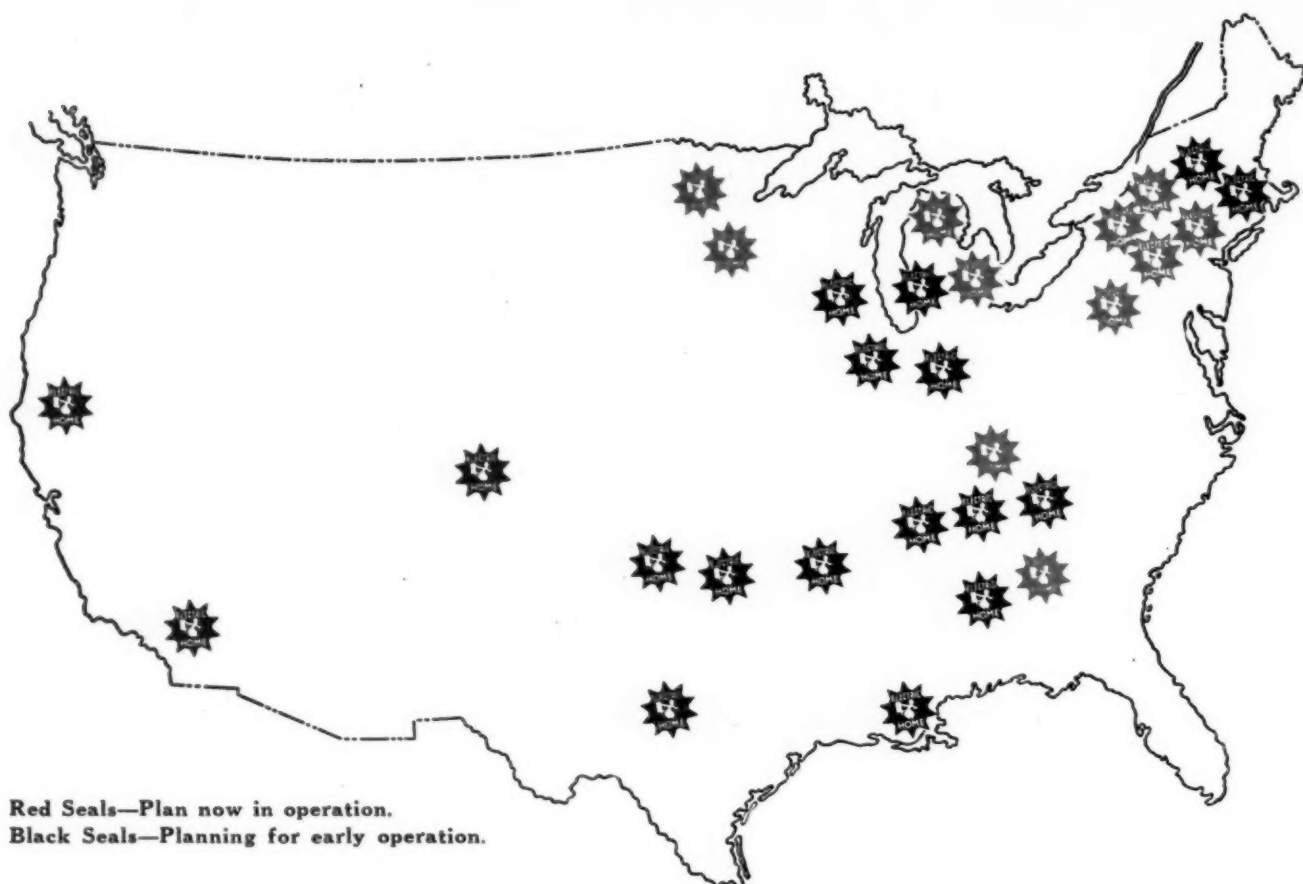
Entertainment of an elaborate nature has been provided for those who attend. The Glad Hand Committee—one of the A E. I. conventions' most delightful institutions—has the entertainment program in preparation. Afternoons, when the convention is in business session,

special trips and other forms of entertainment have been planned for the ladies. Evenings will be given over to the most elaborate program ever attempted at an Electragist convention, including amongst other things a costume ball.

It is too early yet to form any opinion as to the probable attendance, but reports from Chicago, Milwaukee, New Orleans, St. Louis, New York and Cleveland speak of sending one or more special cars of delegates.

It is known that delegates are coming from the Pacific Coast, New England, Florida, Colorado and many other places that are a long way from the convention.

Canada each year sends a delegation larger than the year before and last year their numbers were so large as to draw forth considerable favorable comment. This year one of the Canadian members, W. A. Straith, manager of the Western Elevator and Motor Company, Ltd., of Winnipeg is planning to come by air and bring with him the other Winnipeg delegate, R. N. Elgar, past secretary of the Winnipeg association.



Red Seal Licenses in 298 Communities

UP to the middle of August the Red Seal Plan was being operated in 298 communities in the United States having a combined population of 5,392,368. Adding the population of Toronto—where the plan originated—makes a total population in North America now being appealed to on Red Seal wiring of approximately six million people.

Other centers in the United States and Canada which are planning for early operation of the Red Seal Plan have a combined population of approximately seven million people.

The first license to be granted by the Society for Electrical Development was to the Syracuse (N. Y.) Electrical League on March 24, 1925. To date eleven licenses have been granted as shown in the table. In each case the local body has gone outside its own city to organize the suburban communities because of the vast volume of new house wiring business in the suburbs. The Pittsburgh League, for instance, is operating the plan in 142 communities having a combined population of 1,416,108 people.

The latest reports give a total of ninety-two houses being wired under Red Seal specifications; but, as many of these reports were a month or two old, there is every reason to believe that the number is now well in excess of one hundred. Considering the strength that is being rolled up behind the movement it would be surprising indeed if by the end of the year the number of houses in the United States with Red Seal wiring specifications did not exceed five hundred. Next year there will be thousands.

WHERE RED SEAL PLAN IS BEING OPERATED

League	Date of License	License Serial	Communities 1000 & Over	Population (1920 census)
Syracuse Electric League	3/24/25	A	23	298,000
Electrical League of Rochester	4/10/25	B	26	373,384
Electrical League of the Niagara Frontier	4/15/25	C	21	663,931
Electric League of Pittsburgh	5/ 7/25	D	142	1,416,106
The Electric Club of Louisville	5/16/25	E	3	242,068
Electrical Extension Bureau of Detroit	6/ 4/25	F	41	1,254,680
Hudson Valley Electrical League	7/20/25	G	16	134,337
Grand Rapids Electric Club	7/23/25	H	7	147,081
Electrical League of Minneapolis	8/10/25	I	6	391,531
Electrical League of St. Paul	8/11/25	J	5	248,521
Atlanta Electrical Assn.	8/14/25	K	8	222,729
Total United States			298	5,392,368
Toronto, Canada, Organizer of Plan and Controller of its Operation in Canada				523,000
Total North America				5,915,368

CENTERS WHICH ARE PLANNING FOR
EARLY OPERATION OF RED SEAL PLAN

Denver, Colo.	256,491
Oklahoma City, Okla.	91,295
Tulsa, Okla.	72,075
Youngstown, Ohio	132,358
Nashville, Tenn.	118,342
Memphis, Tenn.	162,351
Chattanooga, Tenn.	57,895
Worcester, Mass.	179,754
New Orleans, La.	387,219
Little Rock, Ark.	65,142
Jackson, Mich.	48,374
Birmingham, Ala.	178,806
Dallas, Texas	158,976
Milwaukee, Wis.	467,147
Schenectady, N. Y.	88,723
Electrical League of Northern Illinois (Suburban territory surrounding Chicago)	757,400
California Electrical Bureau (Plan to be operated for entire state by California Electragists)	3,426,861
Total United States	6,619,209

Additional Communities in Canada

Vancouver, B. C.	125,000
Winnipeg, Can.	196,497
Total for Canada	321,497
Total for North America.....	6,940,706

The first State to be organized as a whole on the Red Seal is California. The California Electrical Bureau is applying for the license but the actual work of promoting the campaign will be undertaken by the California Electragists.

There are a number of other cities besides those in the list in the next column which are considering the Red Seal, but their plans are not yet far enough along to make it advisable to say anything about them at this time.

In Canada, the home of the Red Seal, its application is under the control of the originator of the plan, the Electrical League of Toronto. To date it has licensed no other city in Canada, but both Vancouver and Winnipeg have applied and are expected to be operating the plan in their districts before long.

At the meeting of leagues, Camp Co-operative V, this month, it is expected that plans will be suggested which will give the Red Seal movement a greater impetus than ever.

will differ in most every factory because of the multitude of operations, but the principle is for the most part the same.

The greatest difficulty was met in securing overhead percentage figures for different kinds of manufacturing. Manufacturers, it appears, are not interested so much in the overhead average throughout the plant as they are for that on each operation. In other words, certain departments will have one overhead and other departments a different percentage. Averages, therefore, would be of little value and so there is but little data available.

Overhead Figures

Nevertheless, certain figures have been secured and while they do not represent even a large proportion of the total output of the country they are true figures for the bulk of the production in their own industries.

One accounting firm which has been a leader in installing systems in industrial plants, offers the following figures of overhead expense on the direct labor in the plants it has investigated: In the automobile industry, 125 to 200 percent; in foundries, 100 to 150 percent; in the needle industry, 75 to 125 percent; and in the drop forging industry from 150 to 350 percent. The financial overhead expense, selling, etc., ranges from 10 to 20 percent of the total manufacturing cost in each case.

Another firm of accountants of equal prominence states that among the manufacturers of pieced tinware, galvanized and enameled ware, etc., the low rate of overhead to labor was found to be 153 percent, the high rate 215 percent, and the average 185 percent.

Wire Average 200 Percent

In a group of manufacturers of rubber covered wire and insulated cables, the low rate was 143 percent, the high 308 percent, and the average rate 200 percent.

Thus it will be seen that the electrical contractor doing industrial work who places all his overhead on labor, thereby marking labor up say 70 percent, is merely falling in line with his customers and any idea that a markup of 70 percent on labor is exorbitant is in the contractors' mind because he has been accustomed to think of half this figure or less when applying overhead to the combined cost of labor and material.

Manufacturers Apply Overhead
to Labor

THE theory that overhead should be applied to labor only, as advocated by several writers recently in THE ELECTRAGIST, far from being new is, in fact, the most common practice amongst manufacturers.

Those who advanced this theory for electrical contractors had in mind the growing competition from jobbers and manufacturers of electrical industrial equipment. It is not uncommon for a manufacturer to quote an industrial a price on motors which is equal to or below that at which the contractor can buy. If in addition to such competition the contractor must add to the price of the motor an overhead and a profit, then he is making it more difficult to secure the business.

In industrial jobs, therefore, it has been suggested to the contractor who would compete with the jobber and the manufacturer that he sell the equipment at cost and put all the overhead and profit on the labor.

Contractors before whom this theory has been placed in different parts of the country have admitted its logic, but there has been one question—Would the customer stand for it?

Those who are working on that basis

say they have no trouble and one of the reasons is because that is the way the industrials do all their own costing. And not only that but when industrials add on a percentage for overhead it is up in the hundreds, making the contractor's little 70 percent seem frightfully small.

"Is that a fact" is the question the others ask and so THE ELECTRAGIST instituted an investigation.

Yes, it is most assuredly a fact!

The disposition of overhead has been one of the hardest jobs manufacturers of every class have had to deal with. In spite of the vast amount of work that has been done there is not much actual data available.

There are, however, certain well known accounting organizations which specialize in industrial costing and which are recognized as the authorities.

They agree that the most common practice is that of applying the overhead against labor. There are some instances where both labor and material jointly carry the burden and in cases where the big element of cost is the machine, the overhead is applied against machine hours.

The method of applying overhead

The Peddler Some Leaks in the Corac

The electrical contracting business would be a better business for the people in it if they would pay more attention to their management are responsible for most of the leaks.

What are some of these leaks and how can they be avoided? The answer is given by a jobber's representative. All of the instances told here are actual.

It is our hope that these little stories will help one else from making the same mistakes.

Another issue will take up Leaks in Paying Obligations.—THE EDITOR.

1. Leaks in Buying

False Economy in Purchasing

A CONTRACTOR sat in his store in a busy section of a big city. As the salesmen filed in and out, it seemed to him that competition between jobbers was pretty keen, and he chuckled to himself as he thought how, by playing one house against another, he could save money on his purchases.

"Every cent saved counts in this game." This and a smile were his favorite handouts to the man whose price was two cents high.

Well, it cost him more than two cents each time he said it, for he soon went out of business. And if he had been asked why he had failed, he would have ascribed the disaster, no doubt, to "rotten business and stiff competition."

The Peddler, calling on another contractor located in the same district and faced by the same competitive conditions, asked him what in his opinion had been the cause of the first man's failure.

"Don't know," was the answer, "but he spent an awful lot of time around the store chewing the fat with you salesmen."

"He was one awful close buyer," offered the Peddler.

"I'll tell you," said the successful contractor, confidentially, "he reminded me of a woman I once observed on the street. She dropped a dime in a muddy gutter and in her hurry to recover it neglected to take off a fancy white glove

she wore. You should have seen her face when she came to! The gloves must have set her back a lot.

"I have figured that my time is worth about five dollars a day although some days I make a lot more. But, I don't get the five dollars unless I spend my time right."

"What do you do when you spend your time right?" smiled the Peddler.

"Well—during the day I chase business and unpaid accounts. Evenings, I plan my work and lay out and figure my jobs. I buy most of my material from your house and one other. My bookkeeper keeps a watch on the invoices to see that they are correct. Of course on big jobs I send out inquiries to a number of houses, but I refuse to waste my good time acting as purchasing agent. My idea of a real jobbing house is one that I can trust. I'm willing to pay fair prices to the house that I know won't 'bleed' me, in exchange for the privilege of not having to watch every transaction. *My time is worth more to me chasing new business and old accounts than I could save chasing bargains.*"

Buying from Too Many Houses

THE Peddler asked another customer what he believed was the cause of the same man's downfall. He had an answer ready.

"I can guess what one of his troubles was. I sat next to him at association meeting about two months ago, and all he talked about was how this jobber and that didn't give him a square deal, and

how he called them up on the 'phone and gave them H——. They must all have thought he was a pest. *He bought of too many houses, and couldn't get service out of any one of them.*"

"I guess you're right," said the Peddler. "He was sore at us because we wouldn't make a special delivery of two lengths of half-inch pipe direct to a job for him. And another time he wanted a special credit extension. But *his business with us was so small that it didn't warrant these accommodations.*"

Buying to Get The Long Discount

A LETTER from the credit manager of his house to the Peddler stated that the account of one of his customers was overdue. As is his custom in such cases, he made a call to see if he could size up the situation. He found his man repairing a motor in the shop, and sat down on a coil of cable to think out a way to lead up to the delicate subject of his call.

"Nothing today," volunteered the delinquent. "I've got more than enough of everything on hand."

The Peddler glanced casually along the shelves of the stockroom, and his eye lit on several cartons of a rarely used fitting.

"What are you doing with so many of those 68912's?" he asked, feigning idle curiosity.

"Needed a few on a job; had to buy a case to get a decent price; but I'll get rid of them in time."

"So? Well, we're a fairly big jobbing house, but we only carry about

Points Out Contractor-Dealer Business

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two hundred in stock. They move very slowly."

The delinquent grunted. The Peddler looked further and discovered two other slow-movers in some quantity.

"It costs you more," he said, "than you saved on the price to carry these 'duds' in stock. Why don't you order only what you need on the job in items like these?"

"What do you mean, it costs me more?"

"You've got money tied up here that you need to pay your bills with," returned the Peddler significantly. "At the time you bought this material the money you put into the surplus not really needed wasn't worth so much to you as it is now. You didn't figure on any change in the value of a dollar. Ready money now would enable you to take advantage of your cash discounts, and to keep your credit standing with the jobbers in good shape so you could continue to enjoy thirty-day credit."

The return of the slow-moving goods to the respective supply houses was arranged for, and temporary insolvency somewhat alleviated.

Sending Out for Materials Needed on Jobs in Progress

THE Peddler was interrupted during the demonstration of a new device while the contractor arranged to send a messenger a distance of four miles for two combination switch and bull's-eye plates. The customer had been promised that the job would be finished that day and the plates had been overlooked. A wireman was receiving rather severe

absent treatment at the hands of the 'boss' for not having reported the shortage earlier. The Peddler felt that the 'boss' himself was at fault, since he was the executive, but he didn't feel he knew the man well enough to say so. Instead, he took out his note-book and jotted down some items in the cost of sending out for material to finish a job in progress:

1. Time of the messenger.
2. Automobile expense or carfare.
3. Delivery expense included by the jobber in his price, as part of his overhead. (Thus the delivery is paid for twice.)
4. Possible idleness of the men on the job—wasted labor.

The contractor confessed he had never sat down and looked at the matter from such a 'pessimistic' viewpoint, but agreed that to avoid such a situation in the future was worth trying.

2. Leaks in Store and Stock

Stocking Too Many Parallel Makes of Wiring Supplies

ON a visit to a dealer recently, the Peddler noted five makes of flush switches, two makes of flush receptacles, four makes of fuse plugs and three makes of plug cutouts stacked up on the shelves.

"I've been thinking of standardizing," said the contractor when this variety was called to his attention. "But I have to buy where I can get the best price. Money talks!"

At this point a carton of cutouts ar-

rived from the Peddler's own house. A boy was called to open and put away the material.

"We've got some of these already, Mr. Hopkins," said the boy, pointing to the shelves. "Here's seven and we only need two for Prior's."

"D—— it!" exploded Hopkins, "I didn't see them. And I need all the cash I can get this month, too. Can I return these for credit?" This to the Peddler.

The latter evaded the question.

"With so many different labels, I don't see how you can tell at a glance just what you have and haven't got in stock."

"Oh, I don't have much trouble."

"Here's trouble right here—these cutouts. When you take inventory you have so many parallel items to list and price. Besides, your men on the job have to adapt themselves to all kinds of different lines, which hinders their efficiency. No doubt you sometimes have to put two different makes of flush switches in on the same job, taking a chance of dissatisfying the customer—at least, that's liable to happen most any time."

"Your idea," said Hopkins, "is that if I had all your labels on my shelves everything would be rosy, isn't it? I've got too many makes of cutouts right now, that much is true. So, if you'll give me credit for this batch, I'll have one less make."

"Alright, I'll get you the credit," conceded the Peddler. And the contractor feeling that his mind had been eased on that point, agreed that the

Peddler's arguments had some merit, and that he would try out the suggestion.

Failure to Keep Close Track of Materials Received

"I'm keeping my stock down to a minimum—going to move the first of the month, you know."

This opener set the Peddler to wondering, incidentally, why such a policy was considered more desirable when one is about to move than at any other time.

"I've always got an ear out for new ideas," he opened. "What changes will you make in your new place as a result of your experience in the old?"

"I'm going to make it impossible for goods to get out of the place before record is made of their receipt. I've had more trouble with petty thefts, disputes with jobbers over invoices, because of materials ordered and charged for but apparently not received, confusion over cost sheets, and everything else. My men can't seem to remember anything. In the new place we're going to have a receiving room and it will be against the law to remove anything from there. My stock boy will make record of all receipts and then place the material in stock and charge it to the proper job when it is taken out. I figure my losses here in time and trouble and lost material would have paid the boy's wages for two years. No more slipshod methods for me!"

Failure to Know and Use Turnover Figures as Buying Guide

THE Peddler stopped in to see a dealer who did a fair store business in appliances. A woman coming in to buy an iron had been cornered by a super-salesman from a manufacturer who was expounding to her the merits of the "Whiz-Bang" iron. She bought one and shortly after she left the salesman went out with an order for six.

The Peddler pretended to be impressed.

"How many irons do you sell in a month, Pete?"

"Oh, I don't keep track. Some months five, some months ten, and a good many more around Christmas."

"What irons do you carry?"

"All the good makes. You have to carry what they ask for."

"Will you give me a chance to help you save some money?"

"Not if you mean buy more irons," objected Pete.

"No, not more irons, less irons!"

"Well, what's the dope?"

The Peddler headed up six blank cards with the names of as many six-pound irons as the dealer had in stock. He entered the date and quantity of each on hand.

"Now," he said, "the dope is to put down on the proper card each iron sale you make, and when you buy irons add 'em on. If you keep the record up and don't miss any, I think we can save some money."

"It's a go," Pete agreed.

"And at the end of next month we'll check up."

That was the middle of September. At the end of October the cards looked like this:

MAKE NO. 1			MAKE NO. 2			MAKE NO. 3		
On hand	9/15....	5	On hand	9/15....	4	On hand	9/15....	2
Sold	9/28....1	4				Sold	10/18....1	1
"	10/2 ....1	3						
"	10/8 ....1	2						
Bought	10/9 ....6	8						
Sold	10/20....1	7						
"	10/30....1	6						
On hand	11/1	6	On hand	11/1....	4	On hand	11/1....	1

MAKE NO. 4			MAKE NO. 5 (Whiz-Bang)		
On hand	9/15.....	10	On hand	9/15.....	6
Sold	9/18.....1	9	Sold	9/15.....1	5
"	10/21.....1	8			
On hand	11/1	8	On hand	11/1	5

"Now, where does the money saving come in?" asked Pete as they examined the cards together.

"You had a good average month and a half; sold nine irons," commented the Peddler. "Now let's see what your average gross profit was."

They figured it to be approximately \$1.50 per iron.

"That makes total gross profit \$13.50 on the nine irons sold. Now what did the irons cost you?"

They made it, in rough figures, \$135.00 for the 33 irons purchased and on hand during the forty-five days.

"If it had not been for the 'Whiz-Bang' man," commented the Peddler, "you would probably have sold that woman another make. She must have been open-minded, or she wouldn't have bought that one. She could probably

have been induced to buy a No. 1. You have sold no No. 2, only one No. 3, and two No. 4 out of a stock of ten; and of the well-known 'Whiz-Bang' five remain unsold. You really did not need to carry the Nos. 2, 3 or 5 irons. You had far too many 4's. With an investment of twelve 1's and six 4's, or about \$75.00 you could have done the same business with the same gross profit. In other words you had an investment of about \$60.00 on which you were receiving no return."

"The lady who bought the No. 3 wouldn't take any other make," countered Pete.

"But you didn't know what particular make she was going to demand. Some other woman might come in and ask for a No. 2. It is more profitable to lose a sale now and then than to keep \$60.00

or more tied up in stock with little or no profit just to satisfy an occasional buyer who insists upon having an odd make."

"What'll I do with the surplus stock?"

"Turn into cash as fast as you can. Run a sale. Get all the money you can for them but don't try to make a net profit. Dress your window and show only irons. Then put the proceeds of the sale into faster moving and more profitable merchandise."

"That looks like a good idea. I'll try keeping cards on the other appliances, too, while I'm about it. Don't know why it shouldn't work there as well."

Since the institution of his turnover record, Pete's credit standing and profits earned have very appreciably improved.



An Outline of Inter-Communicating Telephone Systems

By J. B. LONG
Telephone Sales Engineer Western Electric Company



WHEN Elijah Haskins, electrical contractor and dealer of twenty-odd years experience, made a blunder in installing an inter-communicating telephone system he felt like a small boy who goes down in a spelling bee on a simple word such as "cat." Elijah can remember when low-tension wiring was young. Low-tension work came first, and he has assumed for a good many years that if anyone could handle high tension work he could, as a matter of course, take care of the rudimentary low-tension wiring and, specifically, a private phone installation.

He discovered that this was not true. He found himself, after more than twenty years in the business, going back to his a-b-c's and learning the peculiar requirements of low-tension work from the ground up. Some of the things he learned he had known long ago and had forgotten; some he had never known.

Going at the task logically, the first thing he did was to line up a complete classification and technical outline of inter-communicating systems, something convenient and practical for ready reference. He found that it was handiest to classify and outline the systems according to the service which each was designed to give.

It is the character of service, and especially the limitations on service, which determine what particular type to use for a given installation. Sizing up the field from this point of view, Elijah found his outline something like this:

1. SELECTIVE RINGING AND SELECTIVE TALKING

This type of system offers complete, non-interfering service between as few as three or as many as twenty-four sta-

tions. Since it is designed for frequent use, often in important business places, it must be made to meet the most exacting requirements.

As the question of quality is highly important, the contractor should ascertain for himself whether the telephones and materials he is using are of the necessary standard. The bells or buzzers ought to be wound to at least 10 ohms resistance so that ringing will be equally good all over the system regardless of the relative position of the battery. The transmitters and receivers should be of the high resistance type so that transmission will be uniformly good; the sum of their resistance in series ought to be at least 110 ohms. Each inter-phone should be equipped with a retardation or choke coil of high impedance, for at least 100 ohms resistance is required to maintain a uniform battery supply to the transmission circuit.

A system giving this service and of this quality is the type to install in banks, most business houses, factories, large stores and institutions.

This system is usually available with six, twelve, sixteen, twenty and twenty-four push buttons. By merely pressing the correct button it is possible for any station to communicate with any other. As many conversations can take place simultaneously as there are pairs of buttons.

The instruments may be either hand, wall or desk type, according to the place where each is to be used.

In the complete system there must be one pair of wires for each station to connect it with each of the other stations; that is, there are as many individual pairs of wires as there are telephone instruments. There must also be

two pairs of wires common to all stations, connecting them with the talking and ringing battery.

This is known as a "full metallic" system because each station has a full, individual metallic circuit. Naturally there is the minimum chance of cross talk and other disturbances. This may, however, be modified into a "common return" system; that is, each station will have only one individual wire instead of a pair. The wire for the return of the current will be common to all the stations, in which case each station does not have a full metallic circuit of its own, but shares the return wire with all other stations, so that the same high standard of service cannot be guaranteed.

Current is supplied by dry batteries. There will be two sets, one for the ringing circuit and one for the talking circuit. Not more than twelve dry cells will be required; five for talking, and from four to seven for ringing, depending on the distance between stations.

2. SELECTIVE RINGING AND COMMON TALKING

This type offers service less complete than the one just described, because only one conversation can take place at a time. This definitely limits the scope of the system to installations where calls will not be likely to conflict. For such installations the service is good, because any station can ring any other station without interfering with the rest of the system.

Such a system is available with from three to eight stations, for the reason, of course, that with a greater number of stations the common talking feature would be too serious a limitation. This type is well suited to many residences, certain types of business offices where

demand on the service is restricted, and stores.

The sum of the resistance of the transmitters and receivers in such a system should be at least 200 ohms. One retardation or choke coil must be placed in the system near the battery.

Three wires are required to run between all the stations to be used in common by all and there must be one individual wire for each station.

3. CODE RINGING AND COMMON TALKING.

When a button is pressed with such a system, the bell rings simultaneously at all other stations. Moreover, only one conversation can take place at a time. It is necessary to have a code, assigning a certain number of rings to each station, so that each one can identify calls which are intended for it.

The fact that all the bells ring whenever a call is made, definitely removes this system from usefulness in many places. But it is practical and serviceable in homes, on private estates, on farms, and in some departments of factories and business houses. There may be as many as six stations in such a system. If more than six are used, there are likely to be many mistakes and much confusion in recognizing the code signals.

Only three wires are required, all of them common to all the stations. Five dry cells are usually enough to supply current. If the distance between the two farthest separated stations is more than 750 ft., larger wire should be used in wiring. This is more satisfactory than adding more batteries.

4. MASTER AND OUTLYING STATIONS.

a. Common Talking. The distinguishing feature of this type of system is that there is a master station which can call and be called by any one of the outlying stations without disturbing the others. The outlying stations cannot call each other. Only one conversation can be carried on at the same time.

The service is such as is desired in some business houses, storage warehouses, factories, power houses, and places where a central office must be in touch with outlying offices, but the outlying offices do not need to call the central office, nor are several conversations likely to be necessary at once.

This type usually offers from three to eight stations. One wire is necessary to run from the master station to each individual outlying station, and there

must be three wires common to the whole system.

b. Common Talking with Annunciator. The service offered by this system is identical with that just described, except that there is an annunciator in the office with the master station to identify incoming calls. This is the type of equipment especially suited to schools.

As many as twenty stations are provided for. There must be two individual wires for each station to connect it with the master; and two wires common to the entire system.

Five dry cells are necessary when the distance between the master station and the farthest removed outlying station is not more than 750 ft. On lines of greater length, instead of increasing the number of batteries, it is better to use larger wire.

c. One-Way Ringing. This is another variation of the same essential system. It is designed for purposes where it is not necessary or desirable to have the master station call the outlying stations. Thus the outlying stations are enabled to ring the master, but the master cannot ring the outlying stations.

This limitation upon the service reduces the wiring requirements. One wire is required from the master station to each outlying station; and one wire is necessary, common to the whole system. The annunciator is at the master station, but of course, there are no push buttons.

Such an installation might be made in certain institutions and business places.

d. Master with Connecting Cords. This system, another variation of the master and outlying station type, will serve from ten to seventy stations, and provides a means for connecting the different outlying stations so that they can talk with one another. The service is completely non-interfering.

The master station consists of a number of drops and jacks (one for each outlying station), a push button for ringing, a hand set telephone and a cord and plug for calling and answering. To call an outlying station, the master station operator simply inserts the plug into the jack corresponding to the station wanted and presses the ringing button of the annunciator.

Each outlying station is equipped with a push button for ringing the master station and also operating one of the drops on the annunciator, thereby registering the call. The master station

operator answers by inserting the answering plug into the jack corresponding to the drop operated.

If one outlying station wishes to converse with another outlying station, a connection can be established by means of a pair of connecting cords, each cord terminating in a separate plug. The master station operator withdraws the answering plug from the jack of the station calling, inserting in its place one of the connecting cord plugs and proceeds to call the station wanted as explained before. Having obtained an answer, the operator again withdraws the answering plug and inserts in its place the other plug end of the connecting cord. This completes the connection between the two outlying stations.

The suitability of this system for an installation is, of course, limited by the fact that it requires someone to operate it. If there is no one at the master station to take care of the operation, this system cannot be used. It provides, as a rule, no signal to indicate the end of a conversation between two outlying stations. Where a large number of connections are necessary, a private exchange switchboard system will be much more satisfactory, for it provides lamp signals and is otherwise designed for frequent calls between outlying stations.

This particular type of system is suitable, therefore, for service demands which cannot be met by the master station system alone and are not large enough to call for a private branch exchange switchboard. Should the master annunciator with cords be installed, and the demands on the system prove greater than expected, then the system is virtually a failure. This should be avoided by making certain in advance that the master annunciator will be adequate for the purpose, otherwise a switchboard should be installed.

The master annunciator with connecting cords requires one wire, common to the whole system, and two individual wires between the master and each outlying station. At least five dry cells will be required to supply current. A single set will furnish both talking and ringing current.

This system is often used in clubs, Y. M. C. A. buildings, hospitals, private schools, and small hotels or rooming houses.

The drops of the annunciator in this type of system should be wound to a

resistance of at least four ohms, and the bell should be wound to six ohms.

5. PRIVATE EXCHANGE SWITCHBOARD.

A switchboard system is designed to handle a large number of connections between stations which could not be efficiently handled by a system of smaller capacity. For instance, the demands for inter-communication in large

modern hotels and apartment houses frequently make a switchboard system necessary. The switchboard may be installed in the vestibule or janitor's quarters as it requires little time to operate; the janitor, hallman, elevator attendant or clerk can then handle all telephone calls.

In hotels the switchboard system makes possible communication between

all the rooms and the office; and a considerable economy is brought about by the system inasmuch as the amount of clerk and bellboy service is greatly reduced. The system can be arranged so that all calls are received at the main desk during the night or when no switchboard attendant is necessary.

In schools and public institutions, this switchboard system provides for an

INTERCOMMUNICATING TELEPHONES AT A GLANCE

Table of Different Systems According to the Service of Each Type and the Wiring Requirements of Each.

SYSTEM	PRACTICAL LIMIT	WIRING REQUIRED
1. Selective Talking Selective Ringing	24 stations	2 line wires for each station 4 wires common to whole system
2. Common Talking Selective Ringing	8 stations	1 wire for each station 3 wires common to whole system
3. Common Talking Code Ringing	6 stations	3 line wires common to whole system
4. Master and Outlying Stations:		
(a) Selective Ringing by Master, Common Talking	8 stations	1 wire from master to each outlying station 3 wires common to whole system
(b) Annunciator at Master to Identify Incoming Calls, Common Talking	20 stations	2 wires from master to each outlying station 2 wires common to whole system
(c) Annunciator at Master, Master Not Equipped to Call Outlying Stations	24 stations	1 wire from master to each outlying station 1 wire common to whole system
(d) Annunciator at Master, has Connecting Cords to Connect Any Two Outlying Stations	70 stations	2 wires from master to each outlying station 1 wire common to whole system
5. PRIVATE EXCHANGE SWITCHBOARD Switchboard can call any station; and station can call switchboard; and any stations can be connected through switchboard. (A variation of this system provides the same service except that the outlying stations cannot be connected with each other through the switchboard. The wiring requirements are the same).	80 stations	2 individual wires for each station 1 wire common to the whole system
6. APARTMENT HOUSE SYSTEMS		
(a) Non-Interfering Service:		
(1) Vestibule Calls Apartments; Door-opener	24 stations	1 wire for each apartment station 2 wires common to whole system (1 omitted if door-opener is not used)
(2) Vestibule Calls Apartments and Janitor; Apartments Call Janitor; Janitor Calls Apartments; Door-opener	24 stations	2 wires for each apartment station 4 wires to connect vestibule to janitor, etc. 2 wires common to whole system (1 omitted if door-opener is not used)
(3) Vestibule Calls Apartments and Janitor; Apartments Call Janitor; Janitor and Tradesmen Call Apartments; Door-opener	24 stations	2 wires for each apartment station 4 wires to connect janitor, tradesmen and vestibule 2 wires common to whole system (1 omitted if door-opener is not used)
(4) Non-Interfering Service; Janitor Provided with Master Annunciator.	70 stations	2 wires for each apartment station. 5 wires from each vestibule to janitor and coil and condenser box 2 wires common to whole system (1 omitted if door-opener is not used)
(b) Selective Ringing, Common Talking	24 stations	1 wire for each apartment station 3 wires common to whole system
(c) (There are variations of the selective ringing—common talking system corresponding to the different types of non-interfering system. These provide for the apartment calling janitor and laundry and vice versa; for full service or part service, with variations in the wiring requirements accordingly).		

EXPLANATION AND DEFINITIONS

The different types of system are available for different numbers of stations; the number of stations listed in this table is the maximum usually possible with each type. This gives an idea of the approximate scope of each type. Each is available with a smaller number.

Selective Talking and *Selective Ringing*, of course, means that there is no interference; any station can ring and talk to any other, and there may be as many simultaneous conversations as there are pairs of interphones.

Common Talking means that only one conversation is possible at one time. *Code Ringing* means that every time a button is pushed, a bell or buzzer rings at every station simultaneously. Therefore there must be a code, so that each station will respond to a certain number of rings.

The wiring requirements may easily be figured from the number of stations; that is, where two wires are necessary for each station, a twelve-station system requires twenty-four wires throughout; added to the requisite number of common wires—say four—makes a total of twenty-eight.

alarm service. This is because the system is arranged so that all stations can be signalled at the same time, and a general alarm or message of any kind can be given to all stations simultaneously. This makes it of considerable value, because no separate alarm service is needed and the expense is saved.

The maximum capacity of a switchboard system depends upon the traffic conditions which may be expected. If there are not going to be a great many calls per hour, as many as 120 lines may be accommodated.

Two individual wires are required for each station, and one wire common to the whole system. To furnish the current supply a 24-volt storage battery is usually used, but a group of twenty dry cells connected in series will furnish enough current for ringing and line lamp purposes for an installation of from twenty to one hundred lines. The talking battery in such a case should consist of six dry cells in series.

In some installations, when line connections are made outside the building proper, protective apparatus against lightning and power circuits is necessary.

The telephones in such a system should have bells or buzzers wound to at least 140 ohms resistance. The transmitters and receivers should be of high resistance type, the sum of their resistance in series being at least 120 ohms.

All interior wire in the switchboard should be in cable form, and in accordance with a definite color scheme so that any one wire can readily be identified. Circuit labels are furnished.

6. APARTMENT HOUSE SYSTEMS.

The requirements of apartment house service are such that especially designed systems are furnished to meet them. The different types of system correspond in a general way to the types already described; that is, there are systems which provide for non-interfering service, and others for common talking service. The types most generally used are non-interfering, as would be expected because of the nature of apartment house service. The variations between them are mostly related to the needs of the particular installations; for instance, one system provides for connections between a janitor, a laundry, a vestibule and the apartments; another provides only for apartments and janitor, apartments and vestibule, or apartments, vestibule and janitor but not for

a laundry. A door-opener can be included or omitted, as desired, with almost any system.

Apartment house systems also provide especially designed apparatus, such as vestibule panels with letter boxes. One of the most modern developments is the flush mounting vestibule instrument with loud speaker. There is, therefore, nothing which can be detached and nothing which projects. The flare end of the loud speaking horn is attached to the face plate and covered with a protecting screen.

The essentials of telephone systems for apartment house service are:

a. Non-Interfering Service. There are usually four systems which cover the practical service requirements of most apartment houses. One system may be expanded into another by the use of additional apparatus.

The simplest one provides for communication between the vestibule and the apartments, with selective ringing and selective talking. The vestibule can call the apartments, and the apartments can open the door by pressing a button. If the door-opener is omitted from the system, less wiring is needed.

This type of system accommodates any number of stations up to twenty-four. One individual wire is required for each apartment station, and two wires common to the system (only one if the door-opener is not used). A retardation coil and condenser box are required for the vestibule station.

The second type of system, in addition to the above, provides for communication with the janitor, for whom an annunciator is furnished to identify the calls. The addition of the janitor's station to the system makes necessary another coil and another condenser box, and makes the wiring requirements as follows: Two individual wires for each apartment station, two wires common to the whole system (one if the door-opener is omitted), and four wires to connect the vestibule to the janitor and coil and condenser box.

The third type provides, in addition to the above, for communication with a tradesmen's station. The vestibule can call apartments and janitor; apartments can call janitor and open door; janitor and tradesmen can call apartments. In addition to the janitor, tradesmen's station, and vestibule, there may be twenty-four apartment stations.

The wiring requirements are the same as in the previous case.

The fourth type, still with the same class of service, is on a larger scale. It is intended for installations where there is more than one vestibule. For this system, a master annunciator is furnished with the janitor's station. It can accommodate two or more vestibules, one janitor, two or more tradesmen's stations, and as many as seventy apartment stations.

One retardation coil and one condenser box are required for the janitor's annunciator, and each vestibule and tradesmen's station.

There must be two wires common to the system (only one if the door-opener is omitted), two individual wires for each apartment inter-phone, and five wires for connecting each vestibule to janitor, tradesmen's sets and coil and condenser box.

The battery requirements for each of these four systems depend upon the distance between the two farthest stations and the number of stations. Two sets of dry cells are used, one for ringing and one for talking current. Not more than twelve dry cells will be needed.

b. Selective Ringing—Common Talking. This system, designed to render a less expensive and still reliable service, differs only from those that have been described in that only one conversation can take place at a time. It too is available in many combinations.

In the simplest type—providing for one vestibule and the apartments—one individual wire is required for each apartment, and three common wires.

If there are two extra wires for connecting the battery with the vestibule and the janitor's instrument, it will be possible also for the vestibule to call the janitor as well as the apartments.

If the apartments are to call the janitor in addition, there will be four common wires.

If a laundry is added to the system, there will be another common wire.

In short, systems of this class will require two common wires for talking, one common wire for the door-opener, one common wire for ringing the janitor, one common wire for ringing the laundry, and one individual wire for each apartment station installed. Between the vestibule and the battery three individual wires will be required.

[A second article will appear shortly, giving data on wire sizes and kinds, tools, materials and methods of installing intercommunicating telephones—THE EDITOR.]

A Manual of Accounting Practice for Contractors and Dealers

A Working Book Based on the Standard Accounting System But of Great Value to All Others Because of Its Clear and Simple Explanations Illustrated by Actual Examples

THERE will shortly be available to electrical contractors and dealers a Manual of Accounting Practice written with their business as the definite objective. For many months the Association of Electragists has been engaged in the preparation of this manual.

Although based on the Standard Accounting System for Electrical Contractors and Dealers, its value is not confined to users of that system, but rather may it be used by all men in the business.

In a simple yet thorough manner the several elements of accounting practice are explained and where necessary are accompanied by illustrations from actual contractor-dealer experience.

The great trouble with this business or with any other business is poor management. Generally speaking the contractor or dealer doesn't realize that his management is faulty until too late because he doesn't keep a strict account of his costs.

Keeping books only tells one how much is going out and how much is coming in. Accounting means knowing besides what everything costs, tracing any leaks that might occur, and knowing one's exact financial condition all the time.

Its real function is to show the relation that costs, expenses, charges and gross and net profits bear to sales; what was the turnover of stock and capital; how the business stands in relation to its debtors and creditors; what are its proper proportions between fixed and current assets and owned and borrowed capital; what is the relation between net income and capital invested; and finally how all these things compare with similar periods in preceding years.

About eight years ago through the co-operation of the National Electrical Credit Association, the Electrical Manufacturers' Council and the Electrical

CARDINAL PRINCIPLES OF ACCOUNTING

- 1—All forms should be standardized.
- 2—All sales, whether contract, jobbing, day work, or retail should be costed.
- 3—A merchandise account should be created through debit entries for purchases and credit entries at cost of materials sold in any way.
- 4—A general ledger containing all controlling accounts should be made a part of this system.
- 5—All liabilities should be vouchered each month irrespective of receipt of goods or correctness of invoice. Provision should be made for charging vendors for any errors or discrepancies in bills.
- 6—Cash book should combine bank records, both receipts and payments, so that debit entries equalize bank deposits for the month and credit entries equalize charges to bank balance. The cash book should not be used for distribution.—From the Manual of Accounting Practice.

Supply Jobbers' Association, the National Association of Electrical Contractors and Dealers, as it was then called, was enabled to publish the Standard Cost Accounting System for Electrical Contractors and Dealers.

But electrical contractors are not accountants and there have been frequent questions as to the best practice. The accountants whom they have hired to keep their books have not always understood the electrical business. Also in spite of the existence of the Standard System, there are still thousands of contractors with no adequate system.

Therefore the Manual was compiled. It covers all the questions that have been asked so often. It embodies some new forms. It shows the uninitiated what accounting accomplishes and how.

The sections headings which follow will give one an idea of the completeness of the Manual and still it has been kept brief in order not to mar its usefulness:

- I. Cardinal Principles.
- II. Instructions for Opening Books.
- III. Explanation of General Accounting—Theory of System.
- IV. The Job and Sales Records.
- V. The Accounting Books.
- VI. Closing Books for the Month.
- VII. Analyzing the Monthly Statement.
- VIII. Definition and Explanation of Accounts Used in System.
- IX. Illustrations of Forms and Entries.
- X. Departmentalization of Business.
- XI. Work in Progress.

Particular attention is called to the last two sections which cover new ideas. How to departmentalize the overhead so as to know what each department costs and how to account for work in progress have been two of the great stumbling blocks for contractors and dealers.

It is certain that the different departments have different overheads, but what are they? The Manual shows how to arrive at the true overhead for each department.

In the matter of work in progress not a few contractors would find themselves in a very poor condition while certain work was in process but when completed and payment made the books showed up very well. Now the business isn't rich one minute and poor the next as the people accounting would show. And, it is essential that the accounting show the true condition, particularly if money is required from the bank. The Manual also shows how to handle this account correctly.

The book is availed to all contractors and dealers outside the membership of the Association at a price of \$2.00 a copy.

Electrical Manufacturers' Output Valued at \$1,375,467,131

EVERY other year the United States Census Bureau gathers data on the outputs of manufacturing industries. The report for the year 1923 has just been published. It shows an output of electrical products valued at \$1,375,467,131.

The figures for the years 1914, 1919, 1921 and 1923 will be found in the accompanying table. In the ten years the output has increased four-fold.

The full report, which may be obtained from the Government Printing Office at Washington, contains much more detailed figures, amongst which are found the following on radio:

1923 OUTPUT OF RADIO PRODUCTS		
	Number	Value
Loud Speakers	623,146	\$ 5,608,330
Head Sets	1,781,793	5,345,380
Tube Sets	190,374	13,326,116
Crystal Sets	223,303	669,906
Transmitting Sets	1,082	919,930
Transformers	1,571,817	3,929,581
Rheostats and Light-		
ning Arresters		1,377,432
Vacuum Tubes	4,687,400	9,824,172
Miscellaneous		12,999,623
Total		\$54,000,470

As an idea of how radio has grown compare this figure with \$10,647,617 in 1921. Nor do these figures take into consideration batteries or motor-generator sets. Of the small dry cells for both radio and flashlight purposes 30,858,528 were produced in 1921 and 172,436,795 in 1923.

One of the interesting things shown in these figures is the development of the low tension business other than telephone. In 1914 it amounted to only \$674,580. In 1923 it was in excess of \$7,000,000, almost 70 percent of which was in bell buzzers, signal gongs, annunciators, burglar alarms, push buttons, door openers and battery switches.

Another interesting item was that 217 companies had an output valued at \$1,000,000 or more which was 13 percent of the total number of establishments. They employed 81.1 percent of the wage earners of the industry and their aggregate output was equal to 82.8 percent of the total. This proposition was virtually the same in 1919.

CLASS	1923	1921	1919	1914
Total	\$1,375,467,131	\$882,988,855	\$1,063,526,297	\$359,432,155
Products of the industry.....	1,293,001,771	833,985,443	997,968,119	335,170,194
Subsidiary electrical products of other industries ¹	82,465,360	49,003,412	65,558,178	24,261,961
Generating apparatus and parts, and automotive starter-motors.....	99,071,710	58,860,763	86,266,114	17,865,542
Transformers (except measuring-instrument transformers), current limiting reactors, and induction voltage regulators.....	56,142,506	37,930,559	27,060,624	14,513,831
Rotating converting apparatus.....	10,277,180	10,483,927	24,851,404	25,367,895
Motors (not including controllers or automotive starters) and parts and supplies.....	121,242,546	83,057,684	116,893,638	44,176,235
Control apparatus.....	33,176,615	19,550,522	21,583,542	28,394,612
Electric locomotives (mining, industrial, and railway).....	6,817,011	7,792,104	8,159,825	3,720,914
Batteries, and parts and supplies:				
Storage.....	92,843,390	48,558,280	60,036,152	13,080,964
Primary.....	31,787,077	18,324,685	32,427,043	10,321,491
Carbons: Electrodes for lighting and furnaces, brushes, and specialties.....	14,745,541	5,527,654	13,291,615	3,602,741
Searchlights; floodlights; motion-picture, photo-engraving, and stage projectors.....	2,478,988	1,943,402	4,342,246	2,081,545
Incandescent lamps.....	71,966,225	59,728,398	57,646,900	17,350,385
Vacuum tubes, X-ray tubes, and radio lamps and tubes.....	10,672,551	2,210,757	22,984,181	(3)
Rectifying apparatus.....	4,251,495	956,345	1,964,876	147,965
Telegraph apparatus.....	2,085,854	244,069	22,649,365	2,019,956
Radio apparatus (both telephone and wireless telegraph).....	44,176,298	9,549,649	28,074,636	2,792,465
Fire-alarm apparatus.....	2,639,919	2,404,155	2,092,340	1,253,954
Telephone apparatus.....	90,857,998	101,992,354	46,214,342	22,815,640
Industrial apparatus and appliances.....	20,304,145	11,143,855	54,793,195	4,048,915
Household apparatus and appliances.....	67,002,084	37,670,836	19,322,164	8,786,506
Electric measuring instruments.....	28,221,484	21,032,535		
Ignition apparatus for internal-combustion engines ⁴	31,831,251	20,589,193	51,286,793	22,260,847
Switchboards, panel boards, cabinets, circuit breakers, and switches.....	59,396,199	36,298,897	226,327,837	215,382,662
Railway signals and attachments.....	4,465,648	1,620,351	(3)	(3)
Fuses, cut-outs, and fuse plugs.....	9,245,283	4,483,023	7,895,098	1,757,430
Electric signs ⁵	991,030	655,880	(3)	(3)
Insulators:				
Porcelain, except knobs, tubes, and cleats ⁶	4,343,160	3,619,994		(3)
Composition.....	11,742,804	2,820,361	6,504,147	
Knobs, tubes, and cleats.....	288,118	68,371		
Wiring devices: Lamp sockets and receptacles, snap switches, attachment plugs and plug receptacles, face plates, etc.....	34,996,232	21,806,416	226,919,178	27,580,292
Lightning arresters and choke coils.....	3,833,631	2,044,045	2,353,416	1,188,773
Insulated wire and cable.....	184,510,010	98,332,970	128,682,339	69,505,573
Electric-railway line material.....	8,796,369	2,691,124	29,379,145	(3)
Conduits, underground and interior.....	37,500,210	19,346,266	19,266,629	4,874,709
Electric lighting fixtures ⁷	10,404,189	2,452,359	2,703,266	3,383,955
Electric signaling apparatus (other than railway):				
Bell buzzers, signal gongs, annunciators, burglar alarms, push buttons, door openers and battery switches.....	\$4,854,107	\$3,369,558		
Clock mechanisms with electrical attachments, not including time switches.....	1,272,000	779,784	\$6,124,131	\$674,580
Other signaling devices.....	1,016,197	2,294,755		
Electrotherapeutic apparatus, exclusive of X-ray tubes and motor-driven devices.....	5,991,382	6,820,277	5,911,221	2,653,098
Flashlight cases.....	3,642,418	(3)	(3)	(3)
All other electrical apparatus and supplies.....	874,800,144	49,359,002	95,839,071	28,018,436
Amount received for custom work and repairing.....	10,942,327	4,824,954	27,106,016	5,676,592
ALL OTHER PRODUCTS.....	59,873,805	59,748,742	76,573,808	17,951,652

¹ Reported by 123 establishments for 1923, 104 for 1921, 177 for 1919, and 91 for 1914.

² Figures not strictly comparable with those for 1923 and 1921, because of changes in classification.

³ Not reported separately. Included so far as reported, in "All other electrical apparatus and supplies."

⁴ Not including timers. See footnote 8.

⁵ Electric signs are made mainly by establishments engaged primarily in the manufacture of signs and advertising novelties. Such establishments reported electric signs to the value of \$8,101,670 for 1923 and \$5,279,057 for 1921. The values given for this item in the body of the table represent only the products of establishments in the "Electrical machinery, apparatus and supplies" industry.

⁶ Porcelain insulators are made mainly by establishments classified in the "Pottery" industry. Such establishments reported "porcelain electrical supplies" to the value of \$21,128,668 for 1923 and \$14,200,024 for 1921. The values shown for porcelain insulators in the body of the table represent only the products of establishments in the "Electrical machinery, apparatus and supplies" industry.

⁷ Electric lighting fixtures are made mainly by establishments engaged primarily in the manufacture of gas and electric fixtures. Such establishments reported lighting fixtures to the value of \$47,412,578 for 1923 and \$25,689,892 for 1921. The values shown for this item in the body of the table represent only the products of establishments in the "Electrical machinery, apparatus and supplies" industry.

⁸ Includes internal-combustion engine timers, for which the data are incomplete and therefore can not be shown separately. See footnote 4.

~~"Safety First"~~ in the Electrical Contracting Industry

Analysis Shows That While Accident Ratio is Decreasing in Other Industries, it is Growing at Alarming Rate Amongst Employees of Electrical Contractors—Accidents Are Those of Other Trades and Not Confined to Electrical Work

By H. H. STINSON

"SAFETY FIRST" has been the slogan of numberless American industries for the last fifteen years; and, as a result, the accident ratio per man hour in these industries has been steadily decreasing. It has been a humanitarian work and, at the same time, one of great commercial value both to the employer and to the worker.

The electrical contracting field, which has advanced in technical methods, in business administration and in salesmanship with all other industries, is lagging far behind in the safety campaign. Not only has there been no general movement by electrical contractors to promote safety but the subject has apparently attracted very little attention and has been discussed only infrequently. It is not surprising, in consequence of the neglect of this important work, that accidents among employees of electrical contracting firms are growing at an alarming rate.

Comparison of figures for 1924 with those for 1923, both sets being supplied by Lynton T. Block and Company, underwriters, St. Louis, reveals some startling things. Records for individual companies were picked from the files so that a countrywide trend might be shown. The greatest increase was 700 percent for one company. Another had no accidents in either year and the remainder had increases ranging from 25 to 150 percent. Construction in 1924 showed a decided increase over 1923 building but the accident ratio showed a much larger gain.

The figures were as follows for one firm in each of the following cities: St. Louis, 202 accidents in 1923 and 339 accidents in 1924; Houston, 6 accidents in 1923, 11 accidents in 1924; Greenville, N. C., 18 accidents in 1923 and 22 accidents in 1924; a second St. Louis firm, 10 accidents in 1923 and 24 acci-

A CONTRACTOR makes a profit only in proportion to the hours of labor he pays for. If men are out of work due to accidents he makes no money on them, and from the strictly business viewpoint it is mighty good practice for the electrical contractor to forward the thought of "Safety First." This article is the first of several on the subject of safety promotion in the electrical contracting field and shows indubitably that the contractor has not kept pace with the rest of the modern industrial world in safety work. A second article, to appear soon, will show why it costs the contractor money not to cooperate in every way with his insurer. Other articles will discuss various safety methods in use by a number of large and successful contracting firms.—THE EDITOR.

dents in 1924; Detroit, 6 accidents in 1923 and 12 accidents in 1924; Chicago, 4 accidents in 1923 and 10 accidents in 1924; New Orleans, no accidents in 1923 and 7 accidents in 1924.

While these figures are necessarily too incomplete to give a bird's eye view of the accident ratio in the electrical contracting field, they do show the trend to be upward, whereas it is steadily down in practically all other industries of importance.

The bad showing of the electrical contracting field in comparison with others is not due to a more dangerous character of work involved; the part played by electricity in these accidents is negligible. The figures obtained from the above sources indicate that a very large percentage of the claims

handled for the electrical industry by the Exchange result from minor injuries, such as cuts to the fingers and hands, foreign bodies in the eye, punctures of the foot by stepping on scraps, wire or nails left on the floor—all of them accidents which may and do occur in any field. Serious accidents to electrical workers are most commonly caused by falling from ladders, scaffolds, through temporary flooring, slipping on girders, etc. There are very few cases in the files of the Exchange showing injury from contact with current carrying wires.

According to this same source accidents are more apt to occur in large communities than in smaller, possibly for the reason that buildings are larger in the former locations and there are more workmen of other trades occupied on the buildings at the same time the electrical men are at work. On the other hand such contracts are usually let to large firms who are more apt to have worked out some sort of a private safety code and this holds down to some extent the number of injuries which might be caused under the "rush the job through" circumstances that obtain where one sub-contractor is pressing upon the heels of another. The most frequent causes of bad accidents to electrical workmen on big construction are falls from ladders and girders and the dropping of tools and material by other workmen on floors above.

Even in the smaller towns and on jobs handled by the contractor with the small force accidents are too numerous. In residence construction the jobs are likely to be in a messy condition with wire and nails strewn over the floors and with ladders precariously placed or in bad order. There is no difference in the human equation on the small job

and the large but there is generally a lack of system on the smaller work.

The bulk of the serious injuries caused in the electrical construction field occur to men under forty. In twenty-four serious cases recently handled by the Exchange twenty of the men were under thirty-seven years of age, four were over fifty-two and there were none between these ages. This would indicate that not many men over forty are doing hazardous work and additional data shows that the younger men, especially between the ages of nineteen and twenty-eight, are not being as careful as they should be in the performance of their duties.

An interesting sidelight on the proportion of foreign workmen in the electrical contracting industry is afforded by these accident figures. There are approximately sixteen American born workmen injured to one foreigner.

Damage Suit Evil

Not only are accident ratios growing but loss ratios are being greatly increased by reason of larger payments. Some of these larger payments are made necessary because of the damage suit evil and the ease with which soliciting lawyers can induce injured workmen to sign contracts of employment. This evil is not as serious under workmen's compensation acts. At the same time the inclusion of a great many things in these acts made the expenditures greater; that is, a broadening of the interpretation of the act to cover every injury suffered by an employee. Expenditures are increased oftentimes, also, by thoughtlessness on the part of the assured. When an injury occurs the employer should not take the attitude that he carries insurance and therefore it is not going to cost him anything. He should handle the case in the same manner as it would be handled if he were

paying the money direct to the employee. How necessary it is for the employer to work in complete harmony with his insurer will be discussed at length in another article.

All the data collected by Lynton T. Block and Company show the causes of accidents in the electrical construction field to be much the same as those in other industries. It is clear, then, that the contractor can bring his accident ratio to the same favorable level as other trades have theirs by using the same methods they have used. The electrical builder has no safety problems that have not already been solved.

The first step in finding the answer in our industry is a thorough study of

the ordinary causes of accidents and the second is the education of the workmen. THE ELECTRAGIST in conjunction with the above-named underwriters is making studies to determine the relation of accidents to type of construction, age of employee, size of employee, location of job, time of year, time of day, etc., and these studies when completed will be of inestimable value to the individual contractor who wants to conserve human life and maintain a profitable business.

Success in promoting the idea of "Safety First" will mean speaking only from a very practical viewpoint, a greatly increased efficiency in the industry and much lower indemnity rates.

One of the Progressive Southern Electrical Stores

BELOW are shown the exterior and interior of the Electric Equipment Company's store at Nashville, Tenn., one of the most progressive concerns in the south. This company is in its ninth year in business, having started in 1917 when its volume amounted to \$18,000. It has grown to a volume as high as \$75,000.

J. T. Shannon, president of the company, in remarking about the growth of the business stated his policy which has been the reason for his success:

"Volume is not our aim. We figure to make a fair profit on all work done and on all merchandise sold. If we cannot get the job at a profit we let the other fellow have it and save our time and energy for the customer who is willing to pay the price for quality and service."

Mr. Shannon, prior to starting in business in his home town in 1917, had been for several years with the General

Electric Company, later with the Connecticut Light & Power Company as district sales manager in Waterbury and then for three years superintendent of the Greenwich district.

Associated with Mr. Shannon as secretary and treasurer of the company is J. H. Conn who is in charge of fixture sales. Mr. Conn formerly was for a number of years in the retail hardware business in Franklin, Ky.

The employees in the picture have been with the company for a number of years. They are just as much interested in the success of the business, Mr. Shannon states, as though they were stockholders. It is in that way that the company has been able to build up a reputation for good work and courteous service. Those in the picture, reading from left to right, are: L. E. Kidwell, T. J. South, Ed. Kidwell, Chas. Blackburn, J. T. Shannon, Carey Ormer, Ed. Conn, Bracy Holt and J. H. Conn.



How Kansas City Conducts License Examinations

By FRANK J. SEILER
City Electrician, Kansas City, Mo.

OUR Department has frequently received requests from various municipal inspection departments for an outline of our procedure in conducting examinations of applicants for electrician's license. From the number of requests received, it would seem that there is a tendency to standardize on a systematic method of conducting examinations, so as to eliminate complaints from disgruntled applicants who lack the necessary qualifications, but who protest their examination because some other and more qualified applicant received a license.

Our ordinance provides for the licensing of persons, firms or corporations engaged in electrical installation after their authorized representative has passed an examination conducted by the

Board of Examiners which consists of three members: A licensed contracting electrician, and a journeyman workman, both appointed by the mayor, and the city electrician as chairman.

The examination may be in whole or in part in writing, but of a practical and elementary character, sufficiently strict to test the qualifications of the applicant.

There are three classes of licenses:

"A"—Covering all kinds of electrical work, \$100.00 year.

"B"—Covering all kinds of electrical work excepting the installation of rotating electrical machinery of more than one kilowatt capacity, \$50.00 year.

"C"—Covering fixture hanging and assembling, \$25.00 year.

Upon taking office on January 2 of

this year, the writer, a former contractor, met with the other board members to determine what plan of procedure was being followed in conducting examinations. After several meetings it was decided that the applicant should be tested for certain fundamental points of qualification, as follows:

"A" Personal Reference

1. Business Reference;
2. Character Reference.
3. Schooling.

INSTRUCTIONS TO APPLICANTS FOR ELECTRICIAN'S LICENSE

1. Fill out the attached application for presentation upon date of Examination. Do not write in space below applicant's signature.
2. The following references, if obtained will contribute materially to your final grade—
 - (a) Business References (on firm letter head).
 - Secure 2 from Electrical Contractors.
 - Secure 2 from Light Co.'s or other Electrical Public Utilities.
 - Secure 2 from Electrical Supply Jobbers.
 - Secure 5 from Non-Electrical References (Banker, Merchants, etc.)
 - (b) Character References (on firm letter head).
 - Five of the above business references acceptable, if such references cover your character.
3. Schooling: Submit diplomas for any Schooling claimed additional to grade school.
 - (High School—University—Business College—Correspondence Course).
4. Electrical Experience.
 - Applicant must have references, on firm letter heads, certifying to a total of not less than three years experience as an electrician.
5. General Experience.
 - Applicant must answer in writing such questions as pertain to general requirements.
6. Practical Experience.
 - Applicant must answer in writing questions pertaining to practical arithmetic applied to electrical problems.
7. Code Knowledge.
 - Applicant must answer in writing questions pertaining to a practical knowledge of the National Electrical Code.

CITY OF KANSAS CITY, MISSOURI

APPLICATION FOR EXAMINATION FOR ELECTRICIAN'S LICENSE CLASS.....

Date of Application Date of Examination.....
 Name
 Address Tel. No.
 Age..... Length of time in city..... Married.....
 Citizen..... Race..... Nationality.....
 Present Occupation.....
 Present Employer.....
 Proposed Location..... Proposed Occupation.....
 "A" "B"
 Experience, Years, Electrical: Journeyman—Foreman—Contractor—Contractor.
 Insert number of years this line
 Miscellaneous Electrical Experience as follows: (State number of years)

Schooling: Grade—High School—University—Business Course—Night School.

Insert Years
 Miscellaneous Schooling as follows: (State number of years)

Signed.....
 Applicant

RECAPITULATION	GRADE	Approved:
1. Personal Reference	%	
2. General Experience No.....	%	
3. Electrical Experience	%	Contractor
4. Code Knowledge No.....	%	
5. Practical Arith. No.....	%	Journeyman
Total Credits.....	%	
Average Credits (1/5).....	%	City Electrician
Required Credits.....	70 %	Board of Examiners.

Fig. 1—Each Applicant Fills Out the Above Form on Which is Kept His Examination Grades

Fig. 2—With Each Application Blank Goes the Above Set of Instructions

4. Preparation of papers.
- "B" General Experience
Ten questions to be answered in writing on local central station rules.
Local ordinances.
Business methods.
Estimating, etc.
- "C" Electrical Experience
As per written proof submitted.
- "D" Code Knowledge
Ten questions to be answered in writing.
- "E" Practical Electrical Arithmetic
Ten questions (or five questions) to be answered in writing.

Definite points of credit were established under each of the above classifications, and our rules for grading were prepared in written form. It will be noted from sample sheets enclosed that each division (A-B-C-D-E) permits of

ELECTRICAL EXPERIENCE	
CREDITS ALLOWABLE FOR WRITTEN REFERENCES SUBMITTED	
Experience Classification	Number of years so engaged 1...2...3...4...5...6...7...8...9...10
Contractor, Class "A" points credit	2...4...6...8...10...12...13...14...15 max.
Contractor, Class "B" points credit	1...2...3...4...5...6...7...8...9...10
Foreman, Sup't or Estimator points credit	2...4...6...8...10...12...13...14...15 max.
Journeyman Electrician	70...71...72...73...74...75...76...77
Consulting Engineer, Sup't or Estimator, having had no previous experience as Journeyman. Points credit	60...65...70...75...80 Maximum
Workmen claiming additional credits for experience as meter testers, operators, linemen, troublemen, etc., but not actually engaged in inside construction work. Points credit ½ point per year in addition to journeyman experience.	
THE ORDINANCE REQUIRES THREE YEARS PRACTICAL EXPERIENCE AS AN ELECTRICIAN TO BE ELIGIBLE FOR EXAMINATION FOR AN ELECTRICIAN'S LICENSE.	

Sample Electrical Experience Credit Form

a maximum obtainable credit of 100 percent per division. These five divi-

sional grades are brought forward from the examination papers to the recapitulation sheet, totalled, and divided by 5, giving the final average grade. Thus no fractional credits involved.

Our motive has been questioned with regard to Division "A", requiring eleven business reference letters to establish a maximum credit of 25 points. Upon further investigation, however, it will be readily seen that a local or out-of-town applicant in good repute can, in a reasonable time acquire these references, while the irresponsible applicant might be unable to do so. Credit is only given for electrical experience for which written evidence is submitted.

In order to safeguard against the applicant claiming ignorance of the scope of examination to be conducted, each such applicant is given an instruction sheet, as per sample enclosed. Applicants are not examined pending the receipt of certain references.

Sample General Experience, Code or Practical questions are not submitted. Each set, however, is compiled in typewritten form and is applicable to the class license applied for. For instance, Class "A" Code questions are numbered "A"-200-Code, "A"-201-Code, etc. Each examination recapitulation shows the serial number of questions submitted. Should the applicant fail, it is simply necessary to select a different number of questions from our classified question folders, upon the next examination. Each set of questions has a separate correspondingly numbered answer sheet in typewritten form, by which all questions are graded.

PERSONAL REFERENCES	
CREDITS ALLOWABLE FOR REFERENCES SUBMITTED	
1. Business references. (25% maximum obtainable credit).	
Electrical Contractors	2 accepted at 3 points..... 6
Central Station or other utility	2 " at 2 " 4
Electrical Supply Jobbers	2 " at 5 " 10
Non-Electrical References	5 " at 1 " 5
Total obtainable credits	25%
2. Character References. (25% maximum obtainable credit).	
Five of business references acceptable if character reference is included.	
Total obtainable credits	25%
3. Schooling. (25% maximum obtainable credit).	
Grade school	14
High School, 1 point per year. Full scholarship credit	4
College or University (Electrical Course) by diploma	7
Total obtainable credits	25%
Additional credits alternative to above:	
a. Partial College or University Electrical Course, according to time devoted.	
b. Partial College or University Non-Electrical Course, according to time devoted.	
c. College or University Non-Electrical Course, by Diploma	4
d. Accredited Night School or Correspondence Course in Electricity. (By Diploma)	5
e. Partial as in "d", according to time devoted.	
f. Night School or Correspondence Course, Business	3
g. Night School or Correspondence Course, Law	2
h. Night School or Correspondence Course, Non-Electrical trade	2
i. Non-School study of practical books on electricity as may be of value to applicant. (To be passed on by Board). Maximum allowable.....	2
4. Grading of preparation of paper. (25% maximum obtainable credit).	
a. Legibility	Legend: Very poor 1 point
b. Composition	Poor 2 points
c. Spelling	Fair 3 "
d. Thoroughness	Good 4 "
e. Time required	Very good 5 "
RECAPITULATION OF PERSONAL REFERENCES	
No. 1.....	% No. 3.....
No. 2.....	% No. 4.....
Total	% 100% maximum obtainable

Fig. 3—Sample Personal Reference Credit Form

Two Letters

IN the July issue of THE ELECTRAGIST there appeared an editorial entitled "David and Goliath" which pointed out that although generally speaking the central station was the contractor's best friend, there were times when such companies had not the proper consideration for their smaller co-builders of the electrical industry. The case of Denver was then cited, and it was shown that this attitude robbed the company of the full support of the contractors at the recent franchise election to the undoing of the company.

The reply of the Public Service Company of Colorado and the answer to that letter are given below.

Editor, The Electragist,
15 West 37th St.,
New York City, N. Y.

Dear Sir:

My attention has been called to an editorial appearing in the July issue of the Electragist, on page 37, entitled "David and Goliath."

I was indeed surprised to learn that a publication of such standing as yours would subscribe to an article of this kind, particularly inasmuch as the bases of the article are untrue and without foundation. It must have been inspired either by someone who is entirely ignorant of the facts in Denver or by someone who is extremely careless of the truth.

In the first place, I believe that the pleasant relationship existing with the majority of the contractors in Denver is evidenced by the fact that the Electrical Cooperative League, which is an association of all the electrical interests in Denver, including the contractor-dealers, unanimously approved our franchise, and underwrote public newspaper advertisements to that effect. The attached copy of an ad appearing in one of the daily newspapers I believe is sufficient evidence of that fact.

In the second place, this company has never been, nor is it now, in the contracting business. Whatever wiring contracts its active Commercial Department has taken, and which are largely for old houses, have been taken at a price agreed upon with the Contractors' Association and turned over to them in every instance for execution.

In the third place, if there is anything which this company has attempted to do it has been to maintain standard prices for merchandise and it has taken wiring contracts largely for the purpose of stabilizing prices for wiring and to eliminate the usual cut-throat prices which result from unrestricted competition among irresponsible contractors without the stabilizing influence of the public utility.

The inference that the result of the recent franchise election was in any way attributable to unfriendly relationship existing between this company and the other electrical interests could not be farther from the truth and in this connection permit me to say that I feel it is unfair to a large number of responsible contractor-dealers in Denver to place them in such a position, when, in fact, a large majority, and in fact practically all of the responsible contractors cooperate with us in every way possible.

I realize that the harm from such an article cannot be easily undone, nor do I presume to even suggest that this be attempted. This

letter is only prompted by the feeling that your publication, and yourself, as editor, I am sure would not sponsor such a statement were you able to know the facts as they exist, and with the hope that in the future you may not be again misled or influenced by a few of what I may term the radicals, a small minority of whom are associated in the electrical industry in Denver as they are in other cities and other industries.

Yours very truly,

C. A. SEMRAD,
Vice-President and Gen. Com. Mgr.

Our Reply

Mr. Charles A. Semrad, Vice-President and Gen. Commercial Mgr.
Public Service Company of Colorado,
Denver, Colorado.

Dear Sir:

Hindsight is always better than foresight, so we are told, and after reading your letter of July 13th protesting on our editorial in the July issue of THE ELECTRAGIST entitled "David and Goliath", it would seem that there was one point in which we were in error, namely, that the Denver company was actually engaged in the contracting business. You did not say, however, that your company was not going to engage in the contracting business or that such a step was under consideration.

Perhaps this omission was unintentional on your part, but we are of the opinion that had you made such a statement a few months ago regarding your future policy there would have been no opposition from the contractors to your new franchise.

For months the attitude of the Denver utility towards contractors has been so uncertain as to cause the local industry considerable alarm. The indifference of your company at that time towards the contractors is in sharp contrast to the tone of your letter.

The attitude of your company at that time was more in keeping with the attitude found in New York at the offices of the parent company, the Cities Service Company.

In order to learn if the statement of policy that could not be secured in Denver might not be had in New York, two representatives of the Association of Electragists visited the offices of the Cities Service Company and they were told with the utmost frankness that wherever their companies have attempted to establish housewiring on a basis of prices determined by any other means than that of strict competition from such contractors as desired to bid at low prices, it resulted in the cutting by contractors of prices quoted by the central station, and oftentimes, the discrediting of the central station. Accordingly, the Cities Service Company had adopted a policy of conducting housewiring on such a basis as would in their opinion bring them the greatest increased business without feeling the necessity for consideration of whether or not contractors could make a profit as such prices.

It was furthermore stated that contractors had not gone after business aggressively and that the company had to adopt such methods as would bring a greater volume of new business.

When it was pointed out that contractor aggressiveness might be created through greater good-will the reply was that the company had no faith that the contractors of Denver would sink their own personal fights between themselves sufficiently to make contracting profitable no matter how much co-operation the central station gave them, and that, therefore, the company was compelled

to adopt such measures as would give them increased business through their own initiative.

The same condition was stated to apply to merchandising policies. Because the merchandising line is too narrow, in their opinion, to permit electrical stores to merchandise aggressively or profitably, the central station must take the initiative in order to build load rapidly.

When the Cities Service spokesman was asked if the policy of its subsidiary in Durham, in conducting a contracting business in active competition against local electrical contractors was a part of the general policy of the parent company, the reply was that where ever such a department seemed advisable they would feel at liberty to establish it and that their former manager of that department, since transferred to Denver, had made it a valuable asset to them.

When asked if the transfer of this man to Denver was in line with any plan of entering the electrical contracting business in Denver or elsewhere in Colorado, the reply was that while this man had not been sent to Denver to open a contracting department that the local management must determine what the local policy would be.

When asked if the Colorado property would enter active contracting this year, our representatives were told that no provision had been made for it in this year's budget, but it was added "of course, you understand, budgets can be changed at any time if found advisable."

The policy as just stated is not unlike that which caused the German military forces to overrun Belgium. A cold, hard hearted, selfish policy like that never succeeds. None of us are so large and powerful that we can go it alone.

The policy of engaging in wiring installation is not the policy of the utilities generally. One by one they have learned that it is not a business in which they are fitted to engage.

In North Carolina the contractors were antagonized by the policy of a Doherty company in respect to wiring. The man who conducted that department was transferred to Denver. Did you propose to duplicate his efforts in Denver? You had a right to say and the industry had a right to know.

Before closing, we want to add just this: For the past forty to fifty years contractors have been installing electric service. They can go only so fast as the utilities supply service. Is the record of the country such that the utilities are finding it difficult to fill up their plants or rather do we not find that the utilities for years have not been able to build plants fast enough to supply the demand?

Moreover, if we stop for a minute to look backward, who is it that has fostered the low contracting prices that exist in places?—the Central Station. Their house wiring programs have almost always been on the basis of "Low prices" almost never on the basis of "quality".

If the utilities want to increase their load let them get behind quality wiring which means a more adequate job. You can't hold the price down without skimping on adequacy.

Tell the public what adequacy means—how much better a quality job is. Make it easier for the contractor to sell quality and you will find that the appliance load will come automatically.

Generally speaking the contractors are a high grade set of business men—men who on the average are doing better than the average in almost any other retail business. There are a few who sell below any other price, who are irresponsible—they do not last long, and

(Continued on Page 43)

The Elements of Theatre Lighting

By JACOB GILSTON, E. E.

Vice-President, Edwards Electrical Construction Co., New York

IT has been said that if one can light a theatre, there is no type of building he cannot illuminate, for every principle of illumination and every method of lighting is employed in one form or another in equipping the modern theatre. Without a doubt, the art of lighting and light control has progressed more rapidly in the theatre than in any other field of application, and the reason for this is apparent when one realizes the importance of stage lighting effects in creating the desired illusions for a production, and the necessity of making proper provision for lighting the auditorium.

This rapid progress in the improvement of equipment for lighting and light control causes a correspondingly rapid obsolescence of equipment previously installed, so that it is not unusual to find a costly stage installation discarded after two to five years' use and replaced in its entirety, while the replacement of individual pieces of lighting equipment and the installation of supplementary units occurs even more frequently. The progressive demand for increasingly higher light intensities is another contributing factor in accelerating equipment replacement.

Owners Ready to Spend Money

The demands of the theatrical producer for greater flexibility in light control, higher intensities and finer lighting effects have been very insistent and fortunately there has been an accompanying readiness on the part of the theatre owner to make the necessary expenditures in order to secure the desired results, hence theatre lighting experts have encountered less of the inertia to change than is met generally. To be sure, this attitude of the theatre owner has sometimes led to costly mistakes, with the consequence that the lighting of the larger and most costly theatres is now placed almost exclusively in the hands of experts and specialists.

Lighting in the modern theatre may be considered to serve three general

purposes: (a) utilitarian, (b) artistic, and (c) dramatic. The relative importance of each of these functions will vary with the purposes for which the particular theatre is intended. In designing the lighting for a given theatre, every requirement should be analyzed carefully in order that suitable provision may be made for expressing each of these lighting essentials, appropriately.

Auditorium

Let us consider for a moment the auditorium of the theatre: (a) The purely utilitarian purpose is served when sufficient light of proper quality and intensity, free from glare, has been supplied during the performance as well as before and after. Proper provision for emergency lighting would also fall into this class. (b) To fulfill its artistic function, the lighting must aid in producing an aesthetic effect in the auditorium by properly illuminating the architectural features and surfaces and must present a lighting scheme and arrangement that harmonizes with the design of the theatre and reinforces the architectural purpose. (c) The dramatic function of the lighting includes the various lighting effects in color, form and intensity necessary to provide atmosphere and emotional stimulus for the musical or dramatic offering.

The control of the auditorium and stage lighting is usually placed on the stage. The emergency lights in the auditorium should be controlled from the front of the house. Careful study must be given to the question of assigning a location for the stage switchboard and dimmers and before attempting to decide this important matter, it is necessary to know the character of the productions planned for the theatre. Generally the switchboard and dimmers should be placed close together within easy reach of the stage electrician. This equipment may be placed on a balcony above either side of the stage, or on either side of the stage floor, or under

the stage floor (depending entirely upon the type of the production to be served). Also the equipment itself may be placed under the stage floor with the remote controls only on the stage for operation. The stage switchboard and dimmer equipment requires considerable floor and wall space, and often this is not available at the location otherwise most suitable. Structural changes to provide the necessary space are frequently justified, although a large stage equipment may be fitted to a surprisingly small space by a neat and careful design.

There are a number of different types of stage switchboards from which to select the model most suitable for a given theatre, after considering every requirement of that particular house. The two broad classes of stage switchboards are the remote control and the manually operated.

Manually Operated Boards

The manually operated type may be subdivided into three general forms: (a) Master switch non-interlocking type; (b) interlocking type, and (c) interlocking preset type. Within these three forms of the manually operated dead front stage switchboard, there are several types combining features of one or two of the others, as for example, the interlocking master switch type. All the manually operated dead front stage switchboards referred to are the type having lever operated knife switches for the circuits, each switch being made of not less than 100 amperes copper, the switch and fuses being mounted on the rear of the board on separate slate bases and the operated switch handles mounted on the face of a slate panel. A rod connects the switch to the operating handle on the face of the board. Shafts and interlocking devices are added on the face of the dead front board for interlocking control.

The remote control stage switchboard is usually of the preset type with the products of each manufacturer differing

in certain essential particulars. The essential parts of a preset remote control stage switchboard are (1) a bank of magnetic switches, (2) a magazine panel having branch fuses for the circuits, and (3) a pilot board consisting of momentary contact or closed circuit switches. These pilot switches are usually specially designed with rugged handles for rapid and rough usage, and are banked in gangs with pilot light indications, two pilot switches for each magnetic switch circuited for presetting scenes ahead.

The remote control switchboards are elaborate equipments, ingenious in design and afford greater flexibility and ease of control than is possible with the manually operated switchboard. They are higher in price, however, and have not attained a wider distribution because the dimmer which is still a manually operated apparatus impedes and limits the speed of light control, and, since the switchboard and dimmer together constitute the light control unit, the lack of flexibility in either part of the equipment necessarily hampers the efficiency of the whole.

Combinations Available

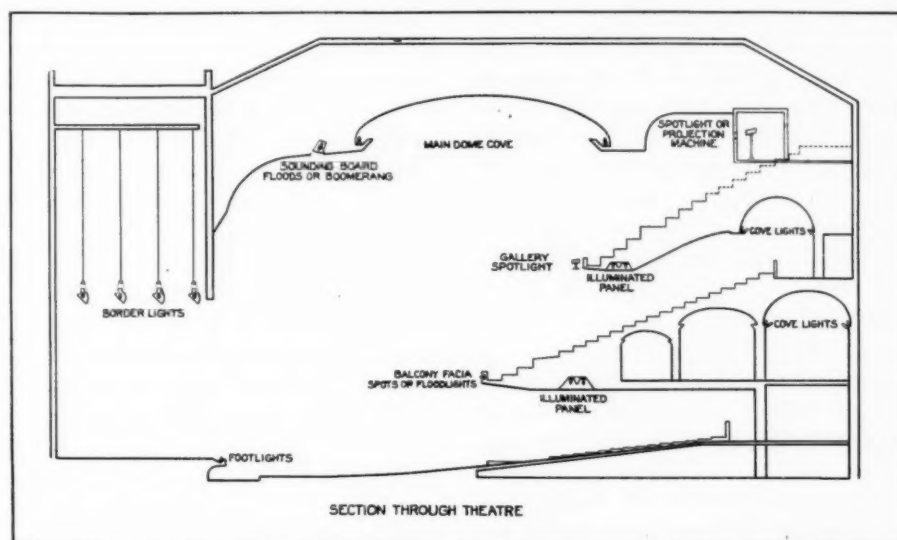
In addition to the fully automatic switchboards, there are also combinations of automatic and manually operated stage switchboards. There are also a number of special equipments not in general use, but having merit for particular application.

Dimmers are an essential part of the light control equipment in the theatre, for their function is to dim and brighten the light and blend colors. The dimmers may be manually operated or remote controlled. The latter may be of the induction or resistance type, operated by steel ropes or rods or by motors or solenoids, or similar devices. The remote controlled dimmer is not widely used at present, but is undergoing developments which may bring it into favor for greater use in the theatre. The resistance type dimmer manually operated and located adjacent to, above or behind the stage switchboard, is the form most commonly used. The stage switchboard and dimmers should be designed together, with the operating handles of each related to the other, so that the whole will constitute a single operating unit for the control of the lights in the auditorium and on the stage.

The lighting of the modern stage requires the installation of a permanent lighting equipment, as well as the provision of plugging outlets and wing nut panels for attachment to portable equipment. Both the permanent lighting equipment and the provisions for portable lighting units should be made on the stage and in places in the auditorium for the lighting of the stage. The relative proportion of permanent equipment to portable equipment varies with the character of the theatre, as does the connected capacity and type of equipment for each.

In a well equipped house, the permanent equipment on the stage should

table capacity. In one New York theatre, for example, there are two 400-amp. 3-pole wing nut panels each supplied by three 500 000-C. M. cables direct from the service, and 680 amperes in stage floor pockets alone. In providing capacity for portable equipment it is important to install dimmers on the main dimmer bank for controlling the portable light, and to arrange for providing color where required. The designing of dimmers for plugging receptacles is often a problem as the portable equipment is an unknown quantity and an incorrect calculation will result in the failure of the dimmer to dim a load that is too light and will



Section Through Theatre to Show the Apparatus Mentioned

consist of a footlight, proscenium strips and border lights, and the connections for portable equipment should consist of stage floor pockets, wall pockets, fly and bridge pockets, grid pockets, company house panels, pin plugs in the footlights, proscenium strips and border lights, also plugging equipment in a hanging bridge.

The permanent equipment in the auditorium for the lighting of the stage consists in general of spot or flood lights in balcony, box or gallery facias and boomerangs in the sounding board, spotlights in the projection room and spot lights masked behind ornamental features in the auditorium. Plugging outlets may be located at any or all of these places.

The portable equipment depends upon the type of production to be presented in a given theatre, and it is necessary to consider the character of the theatre in order to provide proper por-

cause burning out if the load is too heavy.

The selection of the type of border lights, footlights, etc., and determination of their wattages involves a study of the light intensity desired and the suitability of the particular type of equipment for the character of production to be made in a given theatre. Ordinarily the stage is lighted to an intensity of from 15 foot candles to 100 foot candles with all the white lights of the permanent equipment on full.

Border and footlight equipment falls into three general classes: (1) The compartment type, (2) the individual reflector type and (3) the continuous reflector type.

The compartment type and the individual reflector type are designed for use with type "C" lamps usually 100-watt to 500-watt, and arranged for coloring the light by placing a colored medium over the compartment opening.

The colored medium is usually a gelatine screen or colored glass, but natural color glass lamps may be used in place of color mediums.

Borders and Footlights

The continuous reflector type of equipment is intended for use with 60-watt or smaller lamps which may be dipped in dye. The nitrogen filled lamps attain temperatures which destroy the dye film, hence all gas filled lamps must be either of natural color glass, spray or enamel finished, or else arranged for color mediums.

As is usual when making comparisons, not all the advantages are to be found in any one type of equipment. The outstanding advantage of the compartment and individual reflector type border or footlight is the increased efficiency which is made possible by using the type "C" lamp. This kind of equipment is more expensive, however, and is troublesome because the color mediums crack on account of the heat, and because they are subject to mechanical injury. There are further details which lack of space prevents considering in this article.

The fixing of locations for the permanent and portable lighting equipment and the determining of the wattages, capacities and sizes, etc., as well as the best method of control and grouping are all problems that experience alone enables one to solve correctly.

Architectural Treatment

The means of lighting the auditorium usually are wall and ceiling type fixtures, illuminated panels, coves, flood lights, spot lights, reflectors and special lighting equipments. A careful study of the architectural treatment should suggest the most appropriate form of lighting and the balanced locations for visible lighting sources. Where the means of lighting is ceiling fixtures, preference should usually be given to an arrangement employing a few large fixtures rather than a greater number of smaller ones. The character of the theatre will determine the importance of the dramatic functions of the lighting and as the same lighting equipment is often required to serve the utilitarian, artistic and dramatic purposes, it is necessary to consider these requirements carefully before deciding on the lighting scheme to be adopted. If the theatre is intended for concert, motion

pictures and vaudeville, color lighting is important. We find color lighting commonly used today in the auditorium of a theatre to create an atmosphere which induces a receptive mood in the audience, for it is known that color stimulates feelings akin to those inspired by music. Many concert, motion picture and vaudeville producers are employing color lighting in conjunction with musical productions in order to heighten and intensify the effects of the music on the audience, and the writer ventures the opinion that all theatres of the future will be equipped for color lighting and form for dramatic purposes.

Dramatic Possibilities

Consider for example, a production like Max Reinhardt's "The Miracle" in which the drama is carried right into the auditorium and the audience made a part of the action. The dramatic possibilities of light in this type of production are obvious, for the auditorium itself is virtually part of the stage.

In equipping the auditorium for color lighting for dramatic purposes, provision must of course be made for practically all shades of color and degrees of light and this can usually be satisfactorily accomplished by installing white, red and blue lights which by means of dimmers can be blended into almost any tint or shade desired, and for the producers who are interested in color lighting primarily for theatrical effects, special attention may be given to popular preferences for certain colors, these being provided in greatest proportion. It has been observed in studying the reactions of audiences to color lighting, that they are most responsive to blue and purple shades. To create mood and atmosphere by the use of color, the entire auditorium should be suffused with the color light, and for this, large lighted surfaces are necessary. This light should be free from glare, and is usually supplied by lights placed in coves, behind glass panels and in properly designed fixtures.

To obtain the best results with an installation of color lighting, the control should be designed so that very gradual changes in color and intensity may be made. The lighting unit should therefore be equipped for individual and group switching, and the dimmers arranged for interlocking and cross-interlocking control, so that one color may

be dimmed while another is being brightened.

In addition to lighting controlled from the stage, emergency lights should be carried to the front of the theatre, such as exit lights and some general lighting in the auditorium which should be kept lighted all the time. Sufficient light of this character may be supplied to enable a spectator to leave his seat without interfering with a performance or projection. Step and aisle lights are particularly desirable in the balcony where little of the reflected light from the stage reaches the floor.

The lighting of men's smoking rooms, ladies' rest rooms, as well as the lobbies, mezzanine promenades, foyers, etc. require no special comment.

The theatres we have been considering are those having a full stage. Where a short stage or platform only is being provided, the light control equipment may be located in the projection room.

In theatres where motion pictures are to be exhibited and the electrical service is alternating current, it is necessary to install a motor generator or rotary converter to supply direct current for the projection machines as it is not possible to secure good projection from an alternating current arc.

Motor-Generator Sets

Motor-generator sizes vary over a wide range and whether low or high intensity picture machines will be used, the motor-generators should be liberally rated, and duplicate sets installed. Motor-generators may be for series or multiple operation of the arcs. It is claimed for the series type machine that they are more efficient in current consumption than the multiple type, which, because of its constant current characteristics requires no ballast resistance.

The motor-generator for multiple operation of the projection equipment is more flexible than the series machine, because the constant current characteristics of the series machine makes necessary the shunting of some of the current around the spotlight and stereopticon machines, when less current is desired than the series generator can deliver and be stable.

Lack of space prevents a consideration of sign and exterior lighting, and as only enough space was available for general treatment of the subject, we cannot discuss construction difficulties, power and the various signal systems and special wiring.

What Standard Accounting System Did for Hurlbut

THOSE who use the Standard Accounting System find the road to profit. Recently Mark J. Hurlbut of the National Electric Company, Chamberlain, S. D., joined the Association of Electragists and started using the system. This is what he says:

"We have just completed our fourth job of electrical construction since receiving the Data Book and the blank forms as recommended by the Association. We have tried out the system to our entire satisfaction, and although not using all of the forms that you have listed, it is a real system.

"For the contractor or dealer who is doing a very large volume of business, it is very easy to see how the system would be of benefit to him, but the smaller the dealer the less he thinks about such a system, for the reason that he *thinks* he can remember all of the details of a job. Our own conditions are a striking example of this.

"The volume of business for us is about \$12,000 to \$14,000 per year. We will have to admit that even on small jobs, using the system, our profit was greater than on similar jobs for the past years; not that we charged more for our material or labor, but for the reason we knew where we were at all times. No material went out that was forgotten, charges for lost time were made and many other small items that we did not take into consideration before. Our overhead is figured out to a fine point, and profit is figured accordingly.

No More Guess Work

"Furthermore, the system gives the dealer a complete record of all of his work, which is very useful for references now and then. It gives an assurance and a degree of satisfaction that when the final figures are handed in on a job, the contractor *knows* he is right and don't have to worry his way through a mess of figures and items and in the end *guess* whether he is right or not.

"We figure that the money paid the Association has been returned to us already to say nothing of the personal service rendered up to this time by them.

"One of our customers 'kicked' about a time and material job, thinking we had overcharged him. We took our job

sheets and showed him our actual figures on the job. He saw our actual cost, our job expense items, our overhead expense and our margin of profit. After looking over the sheet he forgot about being overcharged and his first remark was 'where did you get next to that system?' This party happened to be manager of a wholesale grocery company at this place. He made the remark that if the grocery dealers had a system one-tenth as good there would be less failures in business. He paid the bill with the remark that our margin of profit was no more than right.

"If the customer knows that his electrical dealer is using such a system in his business, he will feel that he is being treated fair, and will be charged no more than the job is worth, for the reason that all guess work has been done away with, and that he is paying for actual value received."

No Licensing Uniformity Analysis Shows

An investigation recently made of approximately eighty local licensing ordinances revealed a shocking lack of uniformity. In fact the study shows quite clearly that a local licensing ordinance is for the most part a home-grown affair and that the framers did not have access to a standard.

Most places license just the electrical contractor, although many places license every concern engaged in installing electrical equipment according to the class of work. For these different classifications the fee may be the same or not. In most cases the minor classification pays a lower fee, but this is not always the case.

All but about 15 percent of the ordinances analyzed required a license fee the most popular being \$25, with \$50, \$10 and \$100 in second, third and fourth places, respectively. The lowest fee was \$1.00 and the highest \$200.

In about two-thirds of the ordinances the fees were the same for renewal as for the original license. Twenty-five dollars was the most popular renewal fee, with \$5 and \$10 in second and third places.

In the matter of bonding 30 percent required no bond. Thirty-six percent required a \$1,000 bond, 15 percent a

\$500, and the rest scattered between \$200 and \$5000. It is interesting to note that approximately 70 percent of the places having a bond provision in the ordinance required \$1,000 or more.

Book Review

Rewinding Small Motors—By Daniel H. Braymer and A. C. Roe. Published by McGraw-Hill Book Company, New York. 247 pages. Price \$2.50.

This is a highly practical book, intended for the man of some experience in motor repair work who is in need of detailed information on small motor winding. All common commercial types of motors are covered both D.C. and A.C. A particularly valuable feature is the discussion of the preliminary work which is necessary before starting the rewinding, consisting of inspection, tests and making records. Suitable forms are illustrated for a job tag, work order, material and time records, and records of winding data.

In both the D.C. and A.C. sections the following divisions of the subject are taken up: Preparing the core; insulation; kinds of wire; types of windings and advantages of each; detailed instructions for winding; testing during progress of the work and after completion. Instructions are given for changing from single-phase to two or three-phase windings. The final chapter deals with tools and equipment. All chapters are copiously illustrated with half-tones, drawings and diagrams.

This book should be of much value in any motor repair shop and will be found particularly useful by the contractor-dealer who operates a small shop for the repair of motors used on appliances.

Two Letters

(Continued from Page 39)

they do very little work all told. Any policy which reduced all contractors to this low level would react like a boomerang on the utility which practices it.

This magazine stands for the best interests of the electrical contractor and we propose to attack any program which is contrary to those interests. We do not think that the Denver situation was to the best interests of the contractor and if we erred in the statement of any fact please remember that we were without advice from your company because your company was disinclined to take the local industry into its confidence.

Very truly yours,
S. B. WILLIAMS, Editor.

Estimating for Electrical Contractors

Lesson No. 9—House Wiring—Armored Cable Work

BY ARTHUR L. ABBOTT

Technical Director, Association of Electragists

PARALLELING the tables shown last month for knob and tube house wiring, four tables are given here applying to armored cable work. The method is essentially the same in either case; outlet costs are computed by listing the material and labor required for each kind of outlet and costing the items at the market prices. The costs are shown in bold face type in order to show clearly how the tables are intended to be used. The tables used by the contractor will have these spaces left blank to be filled in with the contractor's actual costs.

New House Work

There are few variations in the type of construction of ordinary houses which will effect the cost of armored cable wiring. If the outside walls are brick and must be cut to receive outlet boxes, a time allowance must be added for this which will be about 15 minutes or 0.25 hour for ordinary brick, also the box may have to be secured to the brick with rawlplugs and screws for which 4 minutes each should be added, or 0.13 hour for two screws. If the attic space is unfloored and the cable can be run over the joists, thus avoiding boring, there should be a saving of about 0.1 hour on the time for each ceiling outlet on the upper floor.

WITH this lesson we conclude house wiring estimating. The remaining three lessons will take up miscellaneous small work and additions, complete figures on certain jobs and a discussion of how to keep cost records in a way that will not only furnish data for use in future estimating but also as a check on job cost while in progress.—Editor.

It will be noticed that two columns are included in the table for light outlets, for two different types of boxes. Cast iron or pressed steel boxes specially designed for armored cable work and provided with cable clamps and fixture studs made integral with the box are very extensively used in some localities. They have the advantage of saving the cost of a separate fixture stud and two cable connectors per box, and by their use quite an appreciable saving in labor is effected. The standard 4-in. round or octagon box provides much more room for stowing away splices and for this reason is preferred by many contractors and is required by the local codes in some cities. An enormous amount of armored cable is consumed

annually in New York City and its suburbs, and the cable box is almost universally used there, except for exposed work.

An armored cable job can be laid out very completely and quantities of cable can be easily scaled from a layout. Allowances must, of course, be made for the cable used at outlets and for variations from a straight line between outlets. If this class of work is new to the contractor, it will be well for him to scale the cable as a check against the unit quantities given in Table 1 when plans can be secured for this purpose.

Experienced contractors are divided in their opinions as to the economy of using steel box supports. Some labor is saved by their use and the cost of the hangers must be balanced against their saving, but they make a more substantial job and make it easier to center the outlets accurately.

In sections of the country where armored cable has not come into extensive use, labor costs may considerably exceed those given in the table if the wiremen do not understand how to handle the material and how to systematize their work.

Labor will be saved by providing the workmen with a layout made on the

TABLE 1—ARMORED CABLE WORK—NEW HOUSE

	Unit Cost	Ceiling Outlet in Basement Cable Box		Lt. Outlet Ceil. or Wall		Lt. Outlet Ceil. or Wall Conduit Box		Convenience Outlet		Convenience Outlet Full Circuit		Single-Pole Switch		3-Way Switch		4-Way Switch		Pilot Light and Switch	
		Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost
No. 14 2-Cond. Cable..	\$37.00	17'	\$0.63	16'	\$0.59	16'	\$0.59	13'	\$0.48	24'	\$0.89	14'	\$0.52	8' 12"	\$0.30	16'	\$0.96	20'	\$1.20
No. 14 3-Cond. Cable..	\$60.00																		
Cable Box .....	.11			1	.11	1	.06												
Conduit Box .....	.08	1	.08			1	.06												
Box Support .....	.12	1	.12	1	.12	1	.12												
Switch Box .....	.11							1	.11	1	.11	1	.11	1	.11	1	.11	1	.11
Sw. Box Support.....	.10							1	.10	1	.10	1	.10	1	.10	1	.10	1	.10
1/4" Fixture Stud.....	.03					1	.03												
Cable Connectors .....	.03	2	.06			2	.06											1	.03
Cable Bushings .....	.01							2	.02	2	.02	2	.02	2	.02	2	.02	1	.01
Straps	1/4c	9	.02	4	.01	4	.01	3	.01	12	.03	3	.01	5	.01	4	.01	10	.02
Conven. Outlet .....	.30							1	.30	1	.30	1	.30						
S. P. Switch .....	.40													1	.40				
3-Way Switch	1.75															1	1.75		
4-Way Switch	2.00																	1	2.00
Pilot and Switch.....			.03		.03		.03		.03		.03		.03		.03		.03		.03
Miscellaneous																			
Permit																			
Labor—Hours	1.00	.5	.50	.46	.46	.55	.55	.66	.66	.75	.75	.66	.66	.88	.88	.93	.93	.86	.86
Total Cost			\$1.44		\$1.32		\$1.50		\$1.71		\$2.23		\$1.75		\$2.57		\$3.91		\$4.36

TABLE 2—ARMORED CABLE WORK—OLD HOUSE

Average figures for hard wood 2nd floor, single soft or no floor in attic

	Unit Cost	Lt. Outlet Ceil. or Wall Cable Box		Lt. Outlet Ceil. or Wall Conduit Box		Convenience Outlet		Convenience Outlet Full Circuit		Single-Pole Switch		3-Way Switch		4-Way Switch		Pilot Light and Switch	
		Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost
No. 14 2-Cond. Cable....	\$37.00	22'	\$0.81	22'	\$0.81	20'	\$0.74	24'	\$0.89	20'	\$0.74	9'	\$0.33	18'	\$1.08	20'	\$1.20
No. 14 3-Cond. Cable....	60.00											14'	.84				
Cable Box .....	.11	1	.11	1	.08												
Conduit Box .....	.08			1	.08												
Box Support .....	.12	1	.12	1	.12												
Switch Box .....	.11					1	.11	1	.11	1	.11	1	.11	1	.11	1	.11
1/4" Fixture Stud.....	.03			1	.03												
Cable Connectors .....	.03			2	.06											1	.03
Cable Bushings .....	.01					2	.02	2	.02	2	.02	2	.02	2	.02	1	.02
Straps	1/4c	3	.01	3	.01	3	.01	10	.02	3	.01	3	.01	3	.01	8	.02
Conven. Outlet .....	.30					1	.30	1	.30								
S. P. Switch.....	.30									1	.30						
3-Way Switch .....	.40											1	.40				
4-Way Switch	1.75													1	1.75		
Pilot and Switch.....	2.00															1	2.00
Miscellaneous .....			.03		.03		.03		.03		.03		.03		.03		.03
Permit																	
Labor—Hours	1.00	1.45	1.45	1.55	1.55	1.9	1.90	1.9	1.90	1.9	1.90	2	2.00	2	2.00	1.55	1.55
Total Cost			\$2.53		\$2.69		\$3.11		\$3.27		\$3.11		\$3.74		\$5.00		\$4.96

blueprint with colored pencil. Outlet boxes should first be installed. The joists, etc., are then bored where necessary, with a boring machine, of course, and then the cable is installed between boxes. A fine toothed hacksaw is so effective a tool for cutting the cable that there is little room for improvement.

The time required to locate and install a ceiling outlet box with a steel box support or hanger should not exceed 5 minutes. Twenty-two holes should be bored in 10 minutes. In cutting off the cable, three nicks should first be made with the saw, about 8 inches apart. The armor is then broken at the center nick and the wire is cut with the saw. The armor is then broken at the other nicks and the eight inch pieces pulled off from the conductors. This entire operation should not require more than one minute. To enter the cable to the box and secure it in place

by means of the clamp in a cable box requires about 40 seconds.

The cable is commonly supported by means of pipe straps secured with nails. Staples save some time and seem to be fully as satisfactory as straps, though their use is objected to by some inspectors.

In some cities all exposed work in basements must be rigid conduit. When a house is wired with rigid conduit in the basement and armored cable above the basement, most of the rigid conduit will be 1/2-in. containing four wires or 3/4-in. containing six wires, and under these conditions the costs of both labor and material for conduit work are very nearly the same as the cost for an equivalent installation of armored cable. In the city of Milwaukee, where rigid conduit is required in basements, the combination rigid pipe and cable jobs are done at a labor cost which is well within that indicated by the table.

The labor figures in this table apply to the common type of residence having six to ten rooms, where the building construction proceeds rapidly and where the conditions are such that it is possible for the wiremen to work efficiently.

In the larger and more elaborate type of residence, however, the conditions are often such that a high rate of production is impossible. It often happens that a change is made in the plans which involves no additional outlets and therefore the owner can see no reason for an extra charge, but the resulting delay and change in the layout cause the wiremen to lose considerable time. The owner desires a high class job, and all outlets must be located with great care. The layout includes special switching arrangements and is much more complex than in a small house, and consequently must be carefully checked. The finishing work is slowed down on ac-

TABLE 3—ARMORED CABLE WORK—OLD HOUSE

Outlets installed under single soft wood floor. Exposed work in basement

	Unit Cost	Ceil. Outlet in Basement		Lt. Outlet Ceil. or Wall Cable Box		Lt. Outlet Ceil. or Wall Conduit Box		Convenience Outlet		Convenience Outlet Full Circuit		Single-Pole Switch		Switch 3-Way		Switch 4-Way		Pilot Light and Switch	
		Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost
No. 14 2-Cond. Cable....	\$37.00	17'	\$0.63	20'	\$0.74	20'	\$0.74	20'	\$0.74	24'	\$0.89	18'	\$0.67	8'	\$0.30	16'	\$0.96	20'	\$1.20
No. 14 3-Cond. Cable....	60.00													12'	.72				
Cable Box .....	.11			1	.11	1	.08												
Conduit Box .....	.08	1	.08			1	.08												
Box Support .....	.12	1	.12	1	.12	1	.12												
Switch Box .....	.11							1	.11	1	.11	1	.11	1	.11	1	.11	1	.11
1/4" Fixture Stud.....	.03					1	.03											1	.03
Cable Connectors .....	.03	2	.06			2	.06											1	.03
Cable Bushings .....	.01							2	.02	2	.02	2	.02	2	.02	2	.02	1	.01
Straps	1/4c	9	.02	3	.01	3	.01	3	.01	10	.02	3	.01	3	.01	3	.01	8	.02
Conven. Outlet .....	.30							1	.30	1	.30								
S. P. Switch.....	.30											1	.30						
3-Way Switch .....	.40													1	.40				
4-Way Switch	1.75															1	1.75		
Pilot and Switch.....	2.00																	1	2.00
Miscellaneous .....			.03		.03		.03		.03		.03		.03		.03		.03		.03
Permit																			
Labor—Hours	1.00	.5	.50	1.2	1.20	1.3	1.30	1.5	1.50	1.6	1.60	1.5	1.50	1.7	1.70	1.7	1.70	1.55	1.55
Total Cost			\$1.44		\$2.21		\$2.37		\$2.71		\$2.97		\$2.64		\$3.29		\$4.58		\$4.95

TABLE 4—ARMORED CABLE WORK—OLD HOUSE
Outlets installed under hard wood floor. Exposed work in basement

	Unit Cost	Ceil. Outlet in Basement		Lt. Outlet Ceil. or Wall Cable Box		Lt. Outlet Ceil. or Wall Conduit Box		Convenience Outlet		Convenience Outlet Full Circuit		Single-Pole Switch		3-Way Switch		4-Way Switch		Pilot Light and Switch	
		Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost
No. 14 2-Cond. Cable.....	\$37.00	17'	\$0.63	25'	\$0.93	25'	\$0.93	20'	\$0.74	24'	\$0.89	23'	\$0.85	10' 15'	.37	20'	\$1.20	20'	\$1.20
No. 14 3-Cond. Cable.....	60.00																		
Cable Box .....	.11			1	.11	1	.11												
Conduit Box .....	.08	1	.08			1	.08												
Box Support .....	.12	1	.12	1	.12	1	.12												
Switch Box .....	.11							1	.11	1	.11	1	.11	1	.11	1	.11	1	.11
3/4" Fixture Stud.....	.03					1	.03												
Cable Connectors .....	.03	2	.06			2	.06											1	.03
Cable Bushings .....	.01							2	.02	2	.02	2	.02	2	.02	2	.02	1	.01
Straps	1/4c	9	.02	3	.01	3	.01	3	.01	10	.02	3	.01	3	.01	3	.01	8	.02
Conven. Outlet .....	.30							1	.30	1	.30	1	.30						
S. P. Switch .....	.30																		
3-Way Switch .....	.40													1	.40				
4-Way Switch	1.75															1	1.75		
Pilot and Switch.....	2.00																	1	2.00
Miscellaneous .....			.03		.03		.03		.03		.03		.03		.03		.03		.03
Permit																			
Labor—Hours	1.00	.5	.50	1.9	1.90	2	2.00	2.15	2.15	2.15	2.15	2.15	2.15	2.4	2.40	2.4	2.40	1.55	1.55
Total Cost			\$1.44		\$3.10		\$3.26		\$3.36		\$3.52		\$3.47		\$4.24		\$5.52		\$4.95

count of the time spent in testing, the many special finishes required for plates and the extreme care which must be used to avoid injury to decorations. For a house of this type the labor figures in Table 1 should be doubled. A further addition of 0.5 hour must be made for each outlet occurring in paneled work or other ornamentation, where exact location must be secured from the general contractor's superintendent.

Even these liberal allowances may not be sufficient to cover the delays which may occur in building a house costing in the neighborhood of \$250,000, and for a house of this class, 15 to 20 percent should be added to the above figures. In general, the labor cost per outlet increases as the size of the house increases; the maximum increase being approximately 25 percent after doubling the Table 1 figures and adding the allowance for outlets in paneled work.

Old House Wiring

The discussion of old house work in the August issue applies to armored cable wiring equally as well as to knob and tube work. The figures in Table 2 are averages applying to outlets in all locations in the standard type of two-story house in which the basement work is exposed, the second floor is hard wood and the attic has a single soft wood floor or is unfloored. This table is a safe guide for estimating only where the house falls within a certain definite class.

More accurate estimates may be made by using Tables 3 and 4, and this is a safer method for use by an inexperienced man.

In each of the tables columns are provided for both cable boxes and con-

duit boxes. The same considerations apply here as in the case of new house work.

Summary

The summary takes the same form as the summary of knob and tube wiring costs. The service costs are, of course, the same in either case. Quotations on jobs are made up from this table, after the selling prices have been filled in

to give the desired percentage of mark-up.

Cost Records

Properly itemized cost records have a double value; they furnish estimating data which accurately fits all the actual conditions under which the contractor is working, and they make it possible to keep labor efficiency at a maximum. Some contractors keep itemized labor

TABLE 5—ARMORED CABLE WORK—SUMMARY

SERVICES		Cost	Selling Price
1 or 2 Circuits, 2-Wire.....		\$17.08	.....
3 or 4 Circuits, 2-Wire.....		18.64	.....
5 to 8 Circuits, inclusive, 3-Wire.....		23.15	.....

	New House—Table 1		Old House—Table 2	
	Cost	Selling Price	Cost	Selling Price
Ceiling Outlet in Basement....	\$1.44	.....	
Light Outlet, Ceiling or Wall—				
Cable Box	1.32	.....	\$2.53	.....
Conduit Box	1.50	.....	2.69	.....
Convenience Outlet	1.71	.....	3.11	.....
Convenience Outlet, full circuit	2.23	.....	3.27	.....
Single-Pole Switch	1.75	.....	3.11	.....
3-Way Switch	2.57	.....	3.74	.....
4-Way Switch	3.91	.....	5.00	.....
Pilot Light and Switch.....	4.36	.....	4.96	.....

	Old House			
	Table 3—Under Single Floor		Table 4—Under Hardwood Floor	
	Cost	Selling Price	Cost	Selling Price
Ceiling Outlet in Basement....	\$1.44	.....	\$1.44	.....
Light Outlet, Ceiling or Wall—				
Cable Box	2.21	.....	3.10	.....
Conduit Box	2.37	.....	3.26	.....
Convenience Outlet	2.71	.....	3.36	.....
Convenience Outlet, full circuit	2.97	.....	3.52	.....
Single-Pole Switch	2.64	.....	3.47	.....
3-Way Switch	3.29	.....	4.24	.....
4-Way Switch	4.58	.....	5.52	.....
Pilot Light and Switch.....	4.95	.....	4.95	.....

records on all work, large and small, though this is somewhat difficult and is not a common practice. In the case of house wiring, however, keeping such records is a very simple matter. The method was fully explained in the last lesson. The records are especially important to the contractor who has done little house wiring with armored cable but who decides to make a bid for business by adopting this more modern method.

Bell Work

As the bell work is very frequently included in a house wiring job, Table 5 is included here giving material and labor quantities for the ordinary installation for both new house and old house work.

No attempt has been made to price material because in many of the items there is no standard price because of different grades, sizes and types of apparatus that may be specified.

TABLE 6—BELL WORK

Single Bell or Buzzer and Push Button					
	Unit Cost	New House		Old House	
		Quantity	Cost	Quantity	Cost
Bell or Buzzer.....	1	.....	1	.....
Push Button	1	.....	1	.....
Transformer	1	.....	1	.....
Bell Wire	70'	.....	80'	.....
Miscellaneous
Labor—Hours	1.25	.....	1.75	.....
Total Cost
Selling Price

Additional Bell or Buzzer and Push Button					
	Unit Cost	New House		Old House	
		Quantity	Cost	Quantity	Cost
Bell or Buzzer.....	1	.....	1	.....
Push Button	1	.....	1	.....
Bell Wire	33'	.....	40'	.....
Miscellaneous
Labor—Hours5	.....	.75	.....
Total Cost
Selling Price

Central Station—Contractor Relationship*

By W. E. CLEMENT

Commercial Manager New Orleans Public Service, Inc.

I can recall the time in New Orleans when in the early days my own company was engaged in the electrical contracting business, retiring from it as they did many years ago in favor of the electrical contractor. It is obvious that next to the establishment of the central station itself, wiring—the physical connection with the consumer—underlies all central station service.

In recent years systematic efforts have been made to attract the domestic customer through "House Wiring" campaigns, etc., put on by both central stations and the electrical contractor. In general, however, it has been and still is largely left to the contractors to solicit as well as execute wiring contracts, and as a rule they have necessarily competed on a price basis.

The public is not well informed as to details and naturally wants connection and service at a minimum cost. It can readily obtain information as to the relations between cost and service of anything electrical except in this all important field of wiring. Here there are no standards for its guidance. Cost of the installation rather than its capacity and convenience has been the determining factor. The inevitable result has been that capacity of lines, number of

outlets and switches have been cut down to make possible a low contract price, throttling at the "nozzle" the many channels from reservoirs of power to point of application.

To correct this condition as far as new installations are concerned, "Minimum Wiring Specifications" were prepared by the Joint Committee for Business Development and adopted by many of the lighting company organizations as well as the jobbers' association and other national bodies. The Society for Electrical Development has since developed the "Red Seal" plan, which should serve as a substantial aid in making the recommended "Minimum Wiring Specifications" practically effective.

If these ideas are generally adopted by central stations, contractors and others interested in better wiring, the installation of inadequate wiring will at least not be chiefly due, as in the past, to ignorance on the part of the customer.

So much for new wiring installation, but what of the 13,000,000 homes already, but generally inadequately wired and fixtured? How to correct this condition is a problem—the most serious one connected with the development of the domestic load.

The work of altering existing installations to increase capacity and add convenience outlets now bids fair to open a fairly attractive field for the contractor and at rates which will not discourage the customer.

Obviously the domestic demand cannot be fully developed through these restricted outlets, these "throttled nozzles", and the central station must bestir itself to overcome this handicap. Possibly it will be found profitable in the long run to offer inducements to contractors and to customers to improve existing wiring installations.

We are living in a period of the world's greatest advance; therefore let us endeavor to visualize a time in the near future when, through the far-reaching work of such organization as yours in cooperation with The Society for Electrical Development, the National Electric Light Association and the Electragists, we will bring the entire electrical contracting fraternity into still closer harmony with the central stations with a view of complete cooperation and coordination in the promotion of "quality installations" and the fullest use of electric service.

*Abstracted from address by Mr. Clement before Mississippi Electrical League at Gulfport, July 27.

Thomas F. Hatfield, Indianapolis

THOMAS F. HATFIELD'S background in the electrical business is older than he is himself, for the reason that just one year before he was born his father founded the Hatfield Electric Company, of which the son is now general sales manager. The former of the above-mentioned events took place in December, 1889, in Indianapolis. There followed sixteen years of being raised and educated, before business claimed him. His start was made in 1905 as a meter reader for the Indianapolis Light & Heat Company, but inside of a year he had decided that reading meters offered too limited a scope for his energies. With the intent of doing higher things, he went into his father's business and took the assignment of hanging fixtures. He did hang several jobs but graduated from this class of work when he failed to place a tarpaulin under the legs of a sixteen-foot step ladder on a slippery floor. He obtained the results usually given by this method of working, falling the full sixteen steps with a small soldering pot in one hand and a can of soldering paste in the other. As soon as he recovered he began a Cook's Tour of the contracting business, going through the stock, appliance and construction departments of the Hatfield company and landing finally as general sales manager of the firm. This is far from being a stationary job, since the company has branches in Chicago, Cleveland and Tulsa. Mr. Hatfield has held many offices in the associations of the industry including the presidency of the Association of Contractors and Dealers of Indiana.



Electragists You Should Know

Frank Gaschek, New Orleans

THOUGH Frank Gaschek knew not one word of English when he arrived in this country in 1905, he has become one of the best-known electrical contractors in the South and also one of the best-liked among the members of his own profession, as evidenced by his recent election to head the contractor-dealer association in New Orleans. Mr. Gaschek was born in Austria in 1879, was educated there and got his first electrical experience in the Austrian Army. He served with the Coast Artillery, Field Division, for three years, handling the electrical apparatus for the field lighting system. Following his army service, he felt the call of the newer lands across the sea and emigrated to New Orleans, though he knew not a single soul in that city. His first job was as helper with the Marks Construction Company and he continued there for three years, learning in that period not only the wiring business but also the speech and customs of his adopted country. Just three years later he went into the business on his own, founding the Crescent Electric Company. It was a hard struggle at the beginning but eventually prosperity came and the company now does a very comfortable volume of business the year around. Mr. Gaschek has been a member of the A. E. I. since 1912 and has worked hard to further the aims and the interests of the association. His face has become a familiar one at national conventions. He takes an active interest in local affairs, both in and out of the electrical industry and is a member of the Electric League of New Orleans, the Electrical Contractors Association, of which he is serving as president, the Association of Commerce, the Contractors and Dealers Exchange and the Sub-Contractors Association of New Orleans.



An Analysis of the 1925 Code Changes

Prepared by ROBERT A. GOELLER
Vice President Hatzel & Buehler, Inc., New York

THIS month the new 1925 National Electrical Code embodying all the changes made by the Electrical Committee of the N. F. P. A. will be distributed. While for the most part the changes are minor and serve mostly to clarify rules that were not as clear as they might have been, there are a number of changes which contractors should be familiar with because they represent changed practice.

In not a few instances the contractor by being alert can save considerable money.

These points are all made clear by Mr. Goeller, who has for a long time been a close student of the Code. He will be remembered as compiler of the "Cross Index of the 1923 Code."

Before releasing this analysis it was submitted to A. R. Small, chairman of the Electrical Committee and the presiding officer when these changes were made, who wrote to Mr. Goeller as follows:

"Your analysis of the changes in the National Electrical Code which will appear in the 1925 edition is remarkably well done and fairly complete.

"It is of interest to observe how readily and thoroughly a user of the Code has grasped the result, as well as the intent, of the changes recommended by the Electrical Committee."

The present installment takes up changes through Section 7. Subsequent issues will take up the following sections in a similar manner.—EDITOR.

Article No. 2 General

203. Wire Terminals, Splices and Joints

a. This paragraph has been reworded to clearly define the fact that "Wires larger than No. 8 shall be connected to terminals by soldering into lugs or by solderless connectors," and omits any mention of the carrying capacity of No. 8 wire presumably for the reason that this might be misleading as under table No. 1, of Section 609-E, sub-table A allows an ampere capacity of 35 while sub-table B allows 40 amp. and sub-table C, a maximum of 50 amp. It is also presumed that wires larger than No. 8 present a greater mechanical problem of securing them to terminals and it is to cover this point that soldered lugs or solderless connectors are required on them. For all equipment such as switches, cutout bases, etc., above 30 amp. solder lugs or solderless connectors shall be provided as noted in Section 206-C and it is believed that where No. 8 wire is connected thereto, such lugs or connectors may be omitted if desired. It should be noted, however, that Section 611-D is worded almost identical to old Section 203-A, which is probably due to the fact that separate committees considered different sections. The wording also more clearly defines the requirements where supply conductors serve as a buss and are connected to branch or tap circuit devices, such as cutout buses. Thus, on branch circuit cutouts of not exceeding 30-amp.

capacity, the supply wire may serve as the supply bus and be clamped at intervals to the branch connections. If the wire is stranded, it must be soldered where the clamp engages it. For devices over 30-amp. capacity the connections must be made by means of cable taps connected at one end to the supply conductor and the other end provided with a lug or approved solderless connector for connection to the cutout or equipment or else such cutouts or equipment should be connected with bus bars and the supply wires shall terminate on them in the manner prescribed.

206. General Plan of Investigations

a. Sub paragraph No. 2—a comma has been inserted after "including" to make it read correctly.

b. The second sentence pertaining to supporting holes in bases has been omitted.

c. The responsibility of providing lug terminals has been placed upon the manufacturer by changing the wording from "shall be used" to "shall be provided."

e. This paragraph now pertains to identification of terminals of devices and requires that such terminals shall be identified although the phrase "unless the electrical connection between the pair of terminals intended to be connected to the grounded conductor is clearly evident" permits the omission of the identifying marker under such

conditions. An outstanding example where such identification of terminals presumably may be omitted is on single pole branch circuit panelboards where the grounded conductors of the branch circuits are connected to a magazine neutral bus which of its very nature is easily recognizable:

(f. to n. inclusive have been added and are as follows):

f. This paragraph qualifies paragraph "e" in that terminals of devices over 30 amperes do not require identification.

g. Paragraph "e" is further qualified in that terminals for utilization devices, i. e., receptacles, etc., are not required to have identified terminals although it infers that should marked terminals be used, such identified terminal shall have the grounded wire connected thereto and further requires that single pole switches, a part of the equipment, shall not be connected in the identified conductor which is usually grounded. (See Section 1204 a. pertaining to connection of single pole switches).

h. Qualifies paragraph "e" in that terminals of portable devices are not required to be identified.

i. Covers single pole switches and the like and does not require identified terminals thereon.

j. Further qualifies the omission of marked terminals on receptacles other than the screw shell type. However, it requires that when polarized receptacles

are marked for identification "the terminal intended for connection to the grounded wire shall be the marked terminal."

k. In this new paragraph it will be noted that its wording recognizes the development of a type of attachment plug receptacle having a grounding conductor terminal in order to provide a convenient means of connecting the grounding conductor required in accordance with Section 905-j and it will be noted that such terminal is to be identified in a manner differing from that prescribed in paragraph m.

l. Applies to the identification of the terminal on the screw shell side of Edison screw shell devices except plug fuses.

m. Defines the method of identifying the marked terminal.

n. Applies to identification of lead wires permanently attached to Edison screw shell devices such as weather-proof sockets, sign receptacles, etc.

o. This is old paragraph "e".

Article 3. Outside Supply Lines

301. Line Wires

a. The phrase "is not liable" replaces the word "cannot" in the first sentence. This sentence has also been divided to make two separate ones.

b. "Line wires shall be at least eight feet FROM" has been changed to read "Line wires shall be at least eight feet ABOVE" to be consistent with the wording over which they pass".

302. Joint Lines

a. In the first sentence following "telephone or other signal wires," there has been added "*which enter any building*" and thereby infers that exterior signal or telephone wires such as might be used for operating purposes may be placed on the same cross arm with light and power wires if such signal or telephone equipment is not within any building. It will be noted, however, that "*an exception is made for wires used only for operating purposes by an operating utility and entering buildings used for such purposes.*"

303. Trolley Wires

c. This paragraph has been omitted.

304. Constant Potential Pole Lines Over 5000 Volts

General. The explanatory notes preceding the lettered paragraphs have been rephrased for clarity. In the third paragraph "construction work" has been changed to read "overhead line

work," also to "and it is recommended that the inspection department be freely consulted as to the specific methods to be followed" have been added the words "in any case of doubt."

a. This paragraph has been elaborated on, to cover the arrangement and location of lines in the light of their greatest usefulness and future development and relation to future lines.

b. The wording has been broadened to permit parallel pole lines to be placed close together, as practical conditions so often require and calls for appropriate precautions in such cases. The regulation for operating signal wires is now covered in Section 302-a.

c. This is a new paragraph covering the spacing of lines at various voltages to buildings and through spacing classifications, as follows: Less than 7500 volts, 7500 to 15,000 volts and over 15,000 volts. The spacing of 8 ft. required for lines of less than 7500 volts is similar to the requirements of section 402-b covering service wires. It should be noted, however, that lines up to 7500 volts can be carried over buildings if spaced as required, although lines at 7500 volts and above are not to be carried over any buildings except central stations, sub-stations and transformer vaults. The general sense of old paragraph "c" has been incorporated in new paragraph "b".

d. The spacing of lines from building exceeding three stories or over 50 ft. is now defined under this paragraph, and it is presumed that old paragraph "d" has been omitted as unnecessary.

Article 4. Service

401. General

b. An important change has been made in this paragraph in that subparagraph No. 1 permits a single service to serve "properties and buildings under single occupancy or management." Thus, outbuildings, garages and the like can be wired and protected as though they were practically under one roof. For protection of services covered under sub paragraph No. 1—see Section 405 k. and 806 e. f. and for general protection of services see Sections 405 and 806 as the matter of fuse protection has been omitted entirely in the revised paragraph. The sense of subparagraph No. 2 was embodied in the old paragraph, but by placing it in a separate paragraph it is more clearly set forth, the same applies to the foot note. To cover special conditions gen-

erally subparagraph No. 3 has been added and reads "by special permission."

402. Overhead, from Main to Building

c. This is a new paragraph added to cover underground service leads connected to overhead lines and defines the mechanical protection of such conductors at the pole.

404. Entrance

b. Under the old paragraph it was implied that the conduit must enter the service cabinet whereas in underground services it is common practice to place a terminal box on the service conduit just inside the building and then extend conductors to service cabinet in the open, suitably protected. It was presumably to approve this type of installation that the paragraph was reworded. The phrase "service cabinet" has also been changed to read "service switch cabinet." The term "insulated from ground" has also been changed to read "free from metallic contact with ground" to give a more liberal interpretation of the installation of service conduits on side walls, etc.

d. This paragraph now specifically requires that only the inner end of service conduits from an underground distribution system be sealed, and further omits the mention of any specific type of sealing compound.

e. An entirely new paragraph covering services operating at more than 600 volts. As this paragraph is duplicated without change under Article 50, Systems and Voltages over 600 volts; and forms paragraph "a" of new Section 5009, to avoid unnecessary repetition, the reader is referred thereto.

405. Service Equipment Within Building

a. This is a new paragraph and definitely permits a circuit breaker to serve as a service switch.

b. Modifies old paragraph "a" by adding "panelboard oil switch" and also permitting service switches outside of building. This latter condition was not defined in the old paragraph.

c. This paragraph is a portion of old paragraph "b" in that it provides that the service switch "shall indicate plainly whether it is open or closed." Their installation is also more clearly defined than in old paragraph "b".

d. Old paragraph "b" has further been sub-divided for the sake of clarity

and this paragraph covers generally the latter part of old paragraph "b" concerning service switch arrangement.

e. This is practically the same as old paragraph "c" with the exception that the beginning of the first sentence has been changed to read "an enclosed service switch shall be externally operable" and also in the foot note the phrase "a switch and cutout be installed to control such separately metered installation" is changed to read "a switch and cutout be installed to control each such separately metered installation" to conform to the errata of the 1923 Code.

f. The wording after "single phase system" as follows: "having the neutral grounded shall be of such design that the neutral cannot be opened without opening both of the outer conductors but" has been omitted, otherwise it is the same as old paragraph "d". This change in the wording now provides that switches in the outside legs of 3-wire direct current or a single phase circuit may be single pole whether the neutral is grounded or not.

g. This is in part, old paragraph "e", the word "automatic" having been placed before "circuit breaker." The "and" after "service conductor" has been omitted and a new sentence started as follows: "When fuses are used they shall be controlled by the service switch, etc." Fuses are specifically mentioned as paragraph "j" provides that an automatic circuit breaker may be used in the place of both service switch and fuse.

h. This is a new paragraph and clearly prohibits a single pole circuit breaker that is not interlocked with the other poles in the circuit; or a fuse in a grounded service wire.

i. This is the last sentence of old paragraph "e".

j. This is a new paragraph permitting an automatic circuit breaker to take the place of both service switch and fuse and specifies the types to be used under certain conditions.

k. Old paragraph "f" has been modified to cover a master service supplying a group of buildings under single occupancy or management (see Section 401 b.) and it has also been re-worded to include "fuses or circuit breakers" in place of "cutouts," the word "circuit breaker" is also added again later in the interest of complete comprehension. It will be of more than passing interest to note that this paragraph now clears up the matter of protecting such out-buildings as garages and the like and

accordingly a suitable protective device for such feeders can be installed in the building where the master service enters if it properly protects the wires in the outlying building. See also Section 807-f. for 3-way switching control between main and outlying buildings.

l. The switching of feeder wires to individual building as provided under paragraph "k" is clearly defined in this new paragraph.

Article 5. Wiring Methods

501. Open Wiring

g. See Section 1801 b. for the special requirements prohibiting varnished cloth or tape insulations on conductors in battery rooms.

k. This paragraph has been re-worded so that the voltages are first stated and the spacing of the wires follow. In the last sentence the words "for all voltages" have been added for clarity.

m. The last sentence in the footnote pertaining to unfinished attics and roof spaces has been omitted.

r. The comma after "non-conductor" has been omitted as has also the last paragraph of footnote regarding attics, etc.

s. This is a new paragraph and is in reality the last paragraph of footnote in old paragraph "r" broadened in scope to cover more specifically the treatment of open wires in attics, etc.

502. Knob and Tube Work

f. "An approved terminal fitting shall be used which provides a separate bushed pole for each wire" has been changed to read "an approved terminal fitting having a separate bushed hole for each wire shall be used through which fitting the wires shall pass," etc. The changes do not alter the implied sense of the old paragraph but simply presents it more clearly from an installation rather than a manufacturing point of view.

503. Conduit Work

h. The wording of the old paragraph has been changed so that the word "house" in "isolated house conduit runs, etc." has been omitted. "Insulated from ground" has also been changed to read "free from metallic contact with the ground," the wording "from other metal on the premises" has also been changed to read "from adjacent grounded metal." The two latter changes are consistent with the phraseology used in Section 404 b. in regards to service conduits. With these changes the whole

paragraph is much more clearly defined than the old one and leaves much less room for disputes arising over differences of opinion in its interpretation regarding the matter of insulation from ground of service conduits.

l. This paragraph has been broadened for after "except in the case of stage pocket and border circuits" there has been added "and flashers and carriage call wires and elevator control wires." This addition now places the latter formally in the same category with the former and makes paragraph "m", table No. 3 applicable to all, the heading of which has been changed to cover the addition.

m. The comma after "solid wires only" in the second sentence has been omitted and the footnote of old table No. 3 has been added after the sentence between tables Nos. 1 and 2.

o. In accordance with the errata to the 1923 Code, the phrase at the end of this paragraph, "if the cabinet is not less than 4 in. in width" has been changed to read "if the gutter of the cabinet is not less than 4 in. in width."

504. Other Wire Raceways

i. "And" has been omitted after the following: "metal raceways shall be grounded," also after "that this requirement shall not apply" the wording "to service runs of any length or" has been omitted as Section 504 a. permits raceways to be used in dry places only and as services are generally exposed to moisture the mention of metal raceways in connection with service runs might imply that they could be used therefor. "House" following "insulated from ground" has been changed to read "free from metallic contact with ground," also "other metal" now reads "adjacent grounded metal" making this paragraph consistent with Section 404 b. and 503 h. in respect to isolated runs of conduit, etc.

j. This is a new paragraph treating with the development of combination metal raceways which are sometimes designed to form a baseboard, chair rail or such like. It is of particular interest to note that ten No. 14 wires are permitted in this type of raceway, while in paragraph "f" only four No. 14 wires are allowed. It is presumed that this difference is attributable to the fact that the type of raceway covered under par. "f" is generally designed to be inconspicuous as possible and therefore limited in space while raceways covered

under this paragraph have as their main object, the greatest utility possible.

505. *Armored Cable*

f. "House"—"insulated from ground" and "other metal" has been omitted and in the place of the two latter omissions, new wording to conform generally with changes in Sections 404 b., 503 h. and 504 i. has been inserted respectively as follows: "Free from metallic contact with ground" and "adjacent grounded metal."

Article 6. Conductors

601. *Classification and Construction*

a. Sub paragraph 4 has had a sentence added for clarity as follows: "This may be omitted for slow burning, slow burning weatherproof, and weatherproof wires."

b. Old paragraph "b" has been changed to new Section 602-g. and the new paragraph "b" is old paragraph "c".

602. *Rubber Covered Wire*

c. The word "final" has been added to the next to last sentence clearing up the point that on single conductor cables tape cannot be the final braid but it can be used as the outer braid of an individual wire forming a multiple conductor cable, the latter as a whole of course must have a "final outer covering" of braid and not tape.

g. This is old Section 601 b. and covers the identifying marking requirements of neutral conductors and comes more properly under this section.

603. *Flexible Cords*

c. After the table of insulation thicknesses there has been added a footnote covering exceptions thereto. In the second sentence, the phrase "except in street railway property where cords. Nos. 16 and 18 supplying pendant lamps may have an insulation 1/32 in. in thickness" has been omitted and in its place there has been added the following "except where type S cord is used" and presumably it is the intent to require the use of either 3/64 in. insulation or type S cord on voltages over 300 in all cases. In the footnote a new paragraph has been added concerning the use of type P. O. cord having 1/64 in. insulation and confines its use to portable lamps and fixtures. As noted in errata to the 1923 Code the column headed "Braid on Each Conductor" is a correction of a typographical error which read "branch."

d. After "heater cord" the comma has

been omitted and there has been added "and hard service cord" in order to make this paragraph more specific in its application, also as the sub-paragraphs come first and the table follows, which is the reverse of the old paragraph arrangement the last sentence has been revised to note this new sequence. The sub-paragraphs describing the uses of the different types of cords have been numbered 1 to 11 inclusive and in comparison to the old sub-paragraphs carried downwards in consecutive order the modifications are as follows:

New No. 1 same as old No. 1.

New No. 2 same as old No. 2.

New sub-paragraph No. 3. This is entirely new and covers rubber insulation on type P cord.

New sub-paragraph No. 4. Same as old third sub-par. except that a new sentence has been added to cover the use of type P. O. cord having 1/16 in. insulation.

New No. 5 same as old No. 4.

New sub-paragraph No. 6. This is a new sub-par. and covers the requirement of rubber covered insulation on No. 18 cord for portables in damp places. The old fifth sub-paragraph being omitted entirely.

New No. 7 same as old No. 6.

New No. 8 same as old No. 7.

New No. 9 same as old No. 8.

New No. 10 same as old No. 9.

New No. 11 same as old No. 10.

Following sub-paragraph No. 11, the descriptive tables are given and the following changes are to be noted. Under column "Braids on Each Conductor," opposite "For Hard Usage," "No cotton braids," now reads "No braids" and presumably covers the type of cord having an entire rubber insulation and outer covering of a toughness usually associated with high grade automobile tires. Under "Theater Stages" Type T and S have been changed to read Type PK WP-S and under "Braids on Each Conductor" cotton wrap has been omitted, presumably for the same reason as noted directly above as this type of cord can now be used on stages.

e. The wording "and approved before being used" has been modified to read "and shall be approved before being used" otherwise this paragraph remains the same.

f. This is a new paragraph concerning polarity marking of conductors on flexible cords and gives the requirements therefore, but the wording ap-

parently makes such marking entirely optional with the manufacturers. Section 1402-b provides that where conductors are identified, such identified wire shall be connected to the screw shell side of the socket. It will be noted also that Section 206-h does not require the terminals of portable devices to be identified.

605. *Armored Cables and Cord, Types A.C., C.A., P.A. and PAWP.*

A comma has been added after "armored cable" in the note preceding paragraph "a".

606. *Varnished Cloth Insulated Wire, Type V. C.*

After "for installation" a comma has been added in the note preceding paragraph "a". In the note mentioned, the reader is referred to Article 5 for installation thereof and although paragraph 501-g covers the installation of conductors having this type of insulation, new Section 1802-b does not permit of its use in battery rooms and thus qualifies Section 501-g in its application to such places.

608. *Slow Burning Wire, Type S. B.*

In the second sentence of the note preceding paragraph "a" and following "where wires are bunched" a comma has been added.

609. *Weatherproof Wire, Type W. B.*

Similarly as noted in Section 609 a comma has been added after "For installation."

611. *General Requirements for Use of Conductors*

i. The footnote of the old paragraph has been incorporated as a new sentence at the end of this paragraph.

u. The comma after "direct current" in footnote has been omitted as its insertion was an error and did not give the correct sense desired.

612. *Special Requirements for Use of Flexible Conductors*

a. Changes made in accordance with Section 603-c also 1, already noted.

Article 7. Outlet Box and Cabinets

701. *Outlet Fittings*

c. "Where a hardwood cabinet is used with open work or concealed work" has been changed to read "Where a hardwood cabinet is used with open work or knob and tube work." The old wording was changed as it did not convey the true intent of its application.

m. "Concealed work" changed to

"knob and tube work" to be consistent with change in paragraph "c".

p. After "except as provided" there has been added "for terminal fittings in Section 502." It is to be noted that the old paragraph says Section 503. This was a typographical error noted in errata to the 1923 Code, and is corrected in the revised paragraph which is also made more clear by the addi-

tional wording noted above.

q. The typographical error "wooden joints" has been corrected to read "wooden joists" as noted in errata to the 1923 Code.

702. Cabinets—Cutout Boxes

b. A comma has been added after "wiring compartments" so as to be more correct grammatically.

d. In sub-paragraph No. 2, the word-

ing "A thickness of metal of at least that of No. 12 U. S. gage metal" has been changed to read "A thickness of metal not less than No. 12 U. S. sheet metal gage (0.109 in.). This change is simply a correction of English. The thickness in decimal equivalents has been added.

[The remaining articles will be taken up in succeeding issues.—EDITOR.]

Unit Proposal Prices for Extras

ALL of the above wire, cable, conduit and outlets shall be of the same grade and type as called for in the body of the specifications and these unit prices shall be used in making all addition and deductions for work added or omitted when making changes."

Thus are the architects trying to protect their clients' interests by asking for unit prices on extras.

Such a clause in the specification is not fair to the electrical contractor because the omission of certain work does not necessarily mean that the contractor's cost has been lowered proportionately. In fact if it be just a small amount of work that is to be omitted the cost of making revisions in plans, layouts, materials, bookkeeping, correspondence, etc., will equal if not exceed what it would have cost to actually install the omitted materials.

Furthermore, the original job was figured at a certain job expense and overhead which was not lowered and if anything increased by the omission.

Unit prices for extra work must necessarily be higher than for the same quantity of work under the contract because each extra is ordered only after a lot of correspondence or conference and therefore is costly. To deduct from work omitted on the same basis might easily mean that a contractor on substantial revision would lose all his profit.

Furthermore unit costs will differ with the amount of extra work. If the changes are few and small the cost will be large because of the overhead. If the changes are substantial the costs will more nearly conform to contract costs.

Such a list of unit prices is always a hard matter to handle, the overhead on the extras on a large contract is always very high, therefore, such unit

prices should include a high percentage of mark-up above cost. At the same time, there is always the possibility that a bid will be rejected because the unit prices are too high. However, if ones main bid is low and he can get any favorable consideration at all from the

owners he would probably be allowed to revise the unit prices if the owner felt that they were too high and insisted that they should be reduced.

Extras always involve considerable loss of time in dickering with the owner or architect so that a minimum price would be cost plus 50 percent. Some men charge cost plus 100 percent and in certain types of work this is not too much.

We have received inquiries recently for unit prices for different kinds of outlets, running pipe and pulling wire.

Where it is absolutely necessary to give unit prices the labor data on this page will be found to be helpful. It will not fit every type or class of construction absolutely but it will be found to be substantially close. It is not exact because different types of building and different classes of construction involve different job factors.

The cost data is based on labor at \$1.00 an hour. To it, of course, must be added the material cost and whatever percentage is determined upon to cover overhead and leave a profit.

In presenting the accompanying data attention is called to the conduit figures which apparently show a discrepancy. This is explained in this way: The 1/2 and 3/4 in. conduit is assumed to be lighting circuit work and the labor is merely for running pipe and includes no outlet cost. On the larger sizes, however, all the labor has to be put on the pipe because such items as bending, pipe ending, etc., are not included in the unit list as separate items.

Those using these figures are cautioned not to use them for estimating. They are intended only to be used as unit prices when such are called for before the job is let. When extras are figured after the job is in progress it should be on the basis of known data.

LABOR COSTS FOR UNIT PRICE PROPOSALS

OUTLETS

	Each
Ceiling outlet	\$0.92
Bracket outlet	2.13
Single pole switch outlet	2.43
3-Way switch outlet	2.63
Bracket fan outlet	2.43
Base plug outlet	2.43
Screw plug outlet	2.43

CONDUIT

Size	Per 100 ft.	Size	Per 100 ft.
1/2 in.	\$ 1.40	2 1/2 in.	\$23.00
3/4 in.	1.80	3 in.	31.00
1 in.	9.00	3 1/2 in.	35.00
1 1/4 in.	11.00	4 in.	41.00
1 1/2 in.	14.00	4 1/2 in.	46.00
2 in.	18.00	5 in.	53.00

PULLING WIRE

Size	For Rubber Insulated and Braided Per 1000 ft.	For Rubber Insulated and Lead Covered Per 1000 ft.
No. 14	\$ 8.00	\$ 9.00
No. 12	8.50	10.00
No. 10	9.00	13.00
No. 8	10.00	15.00
No. 6	14.00	18.00
No. 5	16.00	20.00
No. 4	17.00	21.00
No. 3	18.00	23.00
No. 2	20.00	24.00
No. 1	24.00	26.00
No. 0	27.00	29.00
No. 00	30.00	33.00
No. 000	34.00	37.00
No. 0000	41.00	45.00
200,000 C.M. cable	41.00	45.00
250,000 C.M. cable	45.00	50.00
300,000 C.M. cable	50.00	55.00
500,000 C.M. cable	66.00	72.00
600,000 C.M. cable	74.00	80.00
700,000 C.M. cable	81.00	88.00
1,500,000 C.M. cable	125.00	140.00

The Electragist

Official Journal of the
Association of Electragists—International

S. B. WILLIAMS
Editor

The Twenty-Fifth

This year the electrical contractors and dealers hold their Twenty-Fifth Annual National Convention. Some conventions stand out as having accomplished more than others. What will we get done, or what will we start this year?

The stage is set for the most important convention in the long history of the organization. The contractor and dealer is becoming recognized as an essential force in the electrical industry, instead of the necessary evil that many considered him to be not so very long ago.

This year the manufacturers and jobbers are coming to West Baden to hear what the contractor and the dealer have to say. They want to know because they are becoming convinced that this group which stands between them and the public is essential to their development.

If they find the contractors and dealers at West Baden in large numbers they will know that the leaders of the association have the confidence of their industry, and will act accordingly.

But that isn't all. A convention brings one in touch with other men from other places who are engaged in the same business. They have ideas that you should have. This mutual exchange of ideas helps one keep from getting stale.

Come to the convention at West Baden, Ind., September 23, 24 and 25 and be a part of the progressive thinking of your industry. Everybody engaged in the business of electrical contracting and dealing is invited.

What Is Management?

There are two kinds of management in the contracting business. One is the management of others and the second is the management of oneself.

The management of others takes care of the layout of the work, the superintendence, the method of handling a job, and the general employee relations. If this is not well done the most efficient work is not secured.

The management of oneself is different, but it also is an important element in a successful business. Payment of accounts promptly, taking all discounts, wasting no time visiting with salesmen, refusing to be oversold for the sake of an extra discount, making friends everywhere, making oneself known, building a reputation for square dealing, standing behind one's work without a quibble, sticking on the job six days in the week, insisting on getting one's money promptly, having the courage to ask a fair price

and refusing to take a job at a loss—these, and many others are a part of good personal management.

If one is a good manager in both directions he will make money. He can not expect the public to pay for his mismanagement. The size of his profit will be determined by the quality of his management.

Any man with experience in the business who has the ability to manage others and the will to manage himself can build a good substantial profit in the electrical contracting business.

Good Times Ahead

A year ago everyone was saying that 1925 would be a good year and it has. There was lacking, however, in the chorus, the voice of the banker.

Cautious, insisting on being shown, not willing to be sold on anything in which the "wish was father to the thought," the banker has patiently waited. Now his voice is raised above the others.

"Good times are ahead," says the banker and if he says so, it must be true. To the banker good times means a large volume of money, or credit, constantly changing hands. To us this translated means that there is more buying, less unemployment and less cutthroat competition.

However, don't play it too strong. Those who overstocked on the last boom lost what they made. It is much better to have a conservative stock and keep the customers buying longer. Particularly does this hold true of radio.

The Price of Ignorance

Every day there come to the office of the chief electrical inspector of one of our larger cities a dozen or more small contractors who have had work held up because of a violation. Some of them were smart and thought they could get away with something. Most of them just didn't know.

Each one of these men lost two or three hours going and coming besides having the job held up and in many cases having to do the work over and pay another fee.

How much cheaper it would have been to know what is permitted and what not. Thousands and thousands of dollars are lost each year by electrical contractors because of ignorance of the Code.

Because of competition this is one item that cannot be passed along to the consumer. The offending contractors pay the bill out of the profits that they are now complaining about.

Specifications for Assemblies

Last spring when Rome-X came up for consideration by the entire Electrical Committee a resolution was passed directing Underwriters' Laboratories to prepare a set of specifications under which non-metallic assemblies might be approved. Such specifications have recently been prepared in tentative form, as announced elsewhere in this issue, under the name of "Non-Metallic Sheathed Cables."

The term "non-metallic sheathed cables" rather than the more general term "non-metallic assemblies"—may possibly be accounted for by the fact that the Laboratories had accepted for review but two products. Certain it is that the specifications cover one of these, RomeX.

We shall not discuss at this time the various specifications and tests other than to point out that Underwriters' Laboratories admit that they have had to make certain assumptions regarding the installation of the material.

There should be no objection to the Laboratories making any assumption they wish in order to develop tentative specifications that are *subject to review by the Electrical Committee before being put into use.*

This, unfortunately, does not seem to be Underwriters' Laboratories conception of their function for instead of waiting for the Electrical Committee's review they propose, and in fact are in investigating certain materials that have been submitted and, if found to be in accordance with the tentative specifications, they will issue an Underwriters' Laboratories card stating that the product has been found suitable under the proposed method of wiring.

It makes no difference how technically correct the card may be, the fact that it is issued will be taken for granted by the industry as an approval of the material. Nor will the manufacturers of the material do anything to impede the spread of such of an idea.

There has been a lot of bad will created by this entire situation, the action of certain people and institutions which should be absolutely above reproach have been assailed. One would have thought that Underwriters' Laboratories would have been less hasty in the preparation of tentative specifications and the review of products thereunder.

Aside, however, from that side of the matter we are a little at a loss to understand how Underwriters' Laboratories can assume certain wiring methods and then approve products to be used in conformity with those assumptions.

The only body we know of that has a right to make installation rules is the Electrical Committee. It has always been our understanding that Underwriters' Laboratories are set up to review materials offered for use under the Code.

That the Electrical Committee authorized the Laboratories to draw up tentative specifications gives them no authority to make any installation assumptions and to declare materials suitable for use under those assumptions.

Let Us Help

Recently on two different occasions we have printed warnings in these columns which have helped a number of our readers. In the latest case we have been able to bring together a number of dealers who signed contracts under misapprehensions. They are being sued but by being able to get together the case of each is strengthened.

This magazine stands for fair play towards the elec-

trical contractors and dealers. There may be other cases where we can help our readers. We may not always be successful but at least we can try.

Which Is the Best Way?

Every other year picked men from every branch of the electrical industry and from the Underwriters meet in New York to make such revisions in the National Electrical Code as are warranted by the progress of the art. The resulting code is the product of the best brains in the United States on electrical fire code matters.

Nevertheless each year records one or more cities building their own little local electrical code and what a pity.

May be it is the city electrician who is going to build an electrical code for his city that will be a "knockout." He is honest and is inspired by the best interests of his city, but how can he ever hope to compete with the product built by experts.

Or again, perhaps it is the local electrical industry with the home pride uppermost, which says let us analyze the codes of other cities and take the best of each. Such a thing has occurred only recently. Thirty-five codes have been analyzed and it is proposed to build a code which is a composite of the best of each of the thirty-five.

Who is to choose that which is best? Will their judgment equal that of the experts who are responsible for the National Electrical Code?

We should all remember that the nationally organized electrical industry is back of the National Electrical Code for the reason that each of the great national electrical associations believes that the National Electrical Code is best for the public and best for its constituents.

These great national electrical associations have actually joined hands to promote the further adoption of the Code. Through them the National Fire Protection Association has been able to put out an electrical field secretary to work solely on the Code.

Furthermore, there is now available a Uniform Ordinance for such cities as contemplate making a change, which also has the support of the entire electrical industry.

With the electrical industry joining hands to accomplish a definite object isn't it just a little strange that localities here and there insist on going it their own way?

Radio Lessons

Another radio season is starting. What lesson will it teach? We learned the folly of stocking up on sets and parts that were obsolete almost the next day, then we learned the folly of buying from Tom, Dick and Harry, and last year the awful lesson of having to have heavy stocks in the spring against the cut prices of dumped manufacturers' stocks.

Each season brings its own lesson and the next year the successful ones profit by it. Thus this year finds the dealers lining up on agency agreements as a protection against cut prices and dumping.

No one can tell what this season will uncover, but it will be well for every dealer to use the same judgment in radio buying that he does with the rest of his line.

Buy With Caution.

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AUGUST ACTIVITIES

Tentative Specifications for Built Up Assemblies

IN accordance with the resolution of the Electrical Committee of the N. F. P. A., passed at its last meeting, Underwriters' Laboratories have prepared tentative specifications for built up assemblies or as they are called in the specifications "non-metallic sheathed cables." These specifications are to take care of Rome-X and other similar products that might be presented for approval.

From the offices of Underwriters' Laboratories it was learned that the Laboratories are now investigating under these tentative specifications two products, RomeX and another.

The findings of Underwriters' Laboratories in these two cases, and all others of a similar kind which might be reviewed will be released, it was stated, in card form with a statement, if the prescribed tests have been passed, that the material has been found to be un-

suitable under the proposed method of wiring.

In sending these specifications to the press Underwriters' Laboratories have asked that the following statement be made, which is really necessary to an understanding of the situation by those not already familiar with it:

"A necessary step in the procedure implied in the action of the Electrical Committee, N. F. P. A., at its annual meeting in February, 1925, was the preparation by the Staff of Underwriters' Laboratories of a tentative specification in accordance with which examinations and tests would be made of materials for use in a proposed new wiring method. Accordingly the accompanying Tentative Specifications for Non-metallic Sheathed Cable were drawn up and reviewed by the membership of Underwriters' Laboratories Electrical Council and are now available for study and use by the electrical industry and others interested. They are tentative and are subject to addition or other change as experience or study may suggest.

"Those who may study these tentative requirements should bear in mind the status of the projected recognition of such a material and wiring method as regards the National Electrical Code, the sectional Electrical Committee and Underwriters' Laboratories. This appears to be as follows: The wiring method involved in the use of non-metallic sheathed cable is not a method having present recognition in the National Electrical Code (including the forthcoming 1925 edition). The Electrical Committee, N. F. P. A., has asked its standing committee on Article 5 (Wiring Methods) and Underwriters' Laboratories to cooperate in the study of proposed recognition of use of a wiring method involving non-metallic sheathed cables and to submit a report to the next annual meeting of the Committee. This report may or may not recommend recognition of such a method and, whatever its nature, may be endorsed or rejected in whole or in part by the Electrical Committee. The

findings of Underwriters' Laboratories with respect to materials reviewed under the Tentative Requirements will be released pending action by the Electrical Committee on a report from the Committee on Article 5 and constitute one phase of the cooperation requested of Underwriters' Laboratories in the resolution of the February 1925 meeting."

The tentative specifications call for rubber covered code wire to be used in such assemblies but in no case shall it be smaller than No. 14. Provision is made for conductors up to No. 4.

There is to be a fibrous sheath around each rubber-covered wire, of two independent layers, held in place by a braid grip.

Non-metallic fillers are to be used to fill spaces between conductors so as to provide a relatively smooth exterior for the finished cable.

An outer braid is called for which shall be thoroughly saturated with a fire resistant and moisture repellant compound, while the inner sheath must be saturated with a fire retardant compound.

The following tests are called for:

1. Tension Test—The protective and overall coverings are not to open up or fracture after a 3-ft. length of the cable has been subjected to a tension of 300 lbs. for one minute.

2. Elongation Test—Cable is not to show a permanent elongation of more than 3 in. after a 3 ft. piece has been subjected for one minute to a tension of 100 lbs.

3. Crushing Test—The rubber insulation, protective sheath or outer covering shell show no injury after a crushing load of 300 lbs. is applied for one minute to one inch of the cable. The weight is gradually lowered and balanced upon the sample.

4. Flexibility Test—Parallel conductor cable shall be bent on a circle of radius at the inner edge of the cable equal to twice the thickness of the cable and also on a radius at inner edge equal to ten times the width of the cable without fracturing or opening up the sheath or the outer covering. For twisted conductor cable the radius at the inner edge shall be equal to three

State Insurance Monopolies Not Gaining Ground

Monopolistic state compensation insurance has gained no ground so far this year. Bills to establish such funds in Illinois, Massachusetts, Nebraska, New York and Wisconsin were defeated.

In Florida a bill for workmen's compensation through a state monopolistic fund was defeated.

Bills to abrogate such state monopolies in Oregon and West Virginia, however, were defeated.

Chicago Passes Ordinance

As a result of the Illinois enabling act passed recently, Chicago has revived its former ordinance and an electrical commission has been appointed as required by the act. The commission consists of:

Commissioner of Gas and Electricity, John T. Miller; Frank H. Ackerman, electrical contractor; Walter G. Schaefer, journeyman wireman; J. A. Neal, representing the Underwriters and Arthur P. Good, Commonwealth Edison Company.

times the diameter of the cable. These requirements are to be met at both room temperature and at 0 deg. cent.

5. **Flame Retarding Test**—The exterior of the cable shall not flame for more than 60 seconds after first 15 sec. applications of a standard test flame to the exterior of the cable, the periods between applications being 15 seconds. The cable shall meet these requirements in the condition received; after being soaked in water for a period of 24 hours and allowed to dry; and after having been subjected to a temperature of 70 deg. C. for a period of one hour and allowed to cool to room temperature.

6. **Moisture Absorption Test**—The cable exclusive of the rubber covered wire is not to absorb water in excess of 10 percent of its weight when immersed for 24 hours. This test is to be met in the condition received; after subjected to a temperature of 70 deg. C. for one hour and allowed to cool to room temperature; and after being subjected to the flexibility test, both at room temperature and when cooled to 0 deg. C.

7. **Drip Test**—Compounds used in outer braid shall not drip at 70 deg. C. This temperature is maintained for 15 minutes.

8. **Heating Test**—A coil after being subjected to 70 deg. C. for one hour and allowed to cool to 22 deg. C. will not stick together so that the outer covering compound is peeled off leaving exposed untreated sections of braid or weave when cable is uncoiled.

9. **Freezing Test**—Saturating compounds must not crack, peel, chip or flake off when cable is bent as specified in flexibility test immediately after subjection to a freezing temperature for two hours.

10. **Dielectric Strength Test**—A die-

lectric strength between conductors of at least 10,000 volts is required after immersion is made for 24 hours.

11. **Continuity Test**—Conductors must be continuous throughout entire length of cable.

12. **Overload Test**—The cable must not become ignited or incandescent at any point nor drip when each of the conductors is caused to carry for the period required to reach constant hot wire resistance (but not less than four hours) a current of 300 percent of that for which it is rated.

Forsythe Nominated to Head Eastern Inspectors

The second regular meeting of the newly organized Eastern Association of Electrical Inspectors will be held on October 14, at South Manchester, Conn., at which time officers will be elected

and the association put on a regular operating basis.

Joseph C. Forsythe, head of the Underwriters' Inspection Bureau of New York, has been chosen by the nominating committee as its nominee for the office of president. The choices of this committee for the other officers are:

First vice president, W. C. Field, Springfield, Mass.; second vice president, Joseph P. Rohan, Hartford, Conn.; third vice president, Robert M. Nesbitt, Phila., Pa.; treasurer, Allen W. Hopkins, Springfield, Mass. Board of directors: Active member, Mortimer B. Gleeson, Phila., Pa.; associate member, S. S. Hertz, New York; associate member, C. A. Bates, Bridgeport, Conn.

The association is now trying to increase its membership amongst inspectors, contractors, jobbers, manufacturers and others interested in the enforcement of the National Electrical Code.

Walker Elected President of California Electragists

PAPERS on business problems of vital concern to contractor dealers throughout the state of California, the merchandising programs of the Pacific Gas and Electric Company, discussions of particular problems facing the contractors in various parts of the state, and the election of state and division officers filled the programs of the annual convention of the California Electragists, held at the Eureka Inn, Eureka, August 6, 7, 8. In the opinion of many of the old-timers as well as the younger members this was the best convention that the contractor-dealers in California have ever held.

The general open meeting was held Thursday afternoon with president Vic-

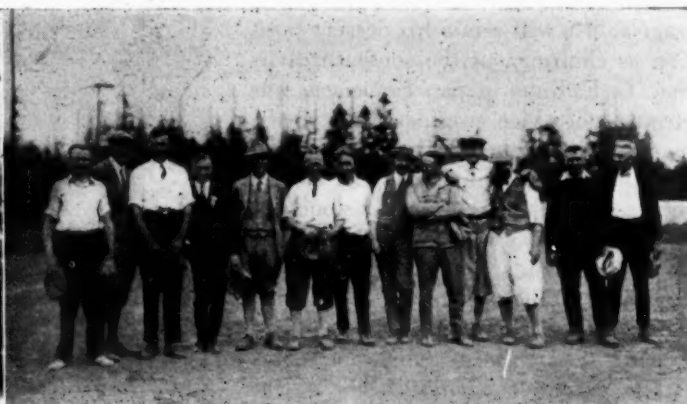
tor Lemoge presiding. C. J. Geisbush, executive secretary of the southern division of the California Electragists, discussed the activities of that division. He emphasized the importance of members using better methods of estimating and told of the methods used in teaching the Electragists' system of estimating to the members of the southern division. He spoke of the recently organized merchandising section which they are trying out and outlined some of the future plans of the division.

George Eldridge, newly appointed field secretary of the northern division, was next introduced to the members.

C. B. Kenney, San Francisco, reported on the work of the northern division of



Bound for the Logging Woods



The Winning Electragist Team

the association. He explained in detail the operation of the San Francisco Association and urged other localities to install similar systems. He stated that the future plans of the California Electragists included quarterly meetings of executive committeemen from all over the state, and all the expenses of delegates would be paid by the organization so as to insure the attendance of all members.

E. Earle Browne, manager of the Electrical Contractors and Dealers Association of San Francisco, discussed the co-operation of the San Francisco Association with the city electrical department and the Electrical Inspectors' Association of California. Urging all members not only to cooperate but to become members of that body. Mr. Browne emphasized the importance of the trade distribution policy of President Fowler of the National Association. Clyde Chamblin, San Francisco, discussed the Red Seal Plan which will provide a national standard of adequate electric wiring in the home.

H. H. Courtright, Fresno, read an interesting paper "The Future of the Electrical Industry, As I See It," which not only outlined the probable development as seen by Mr. Courtright, but quoted numerous well-known authorities to substantiate his predictions.

Merchandising problems of the Pacific Gas & Electric Company and the Great Western Power Company proved to be one of the interesting topics at the meeting for it affects every contractor-dealer in the state as well as the members of all other branches of the industry. These plans were discussed by H. M. Crawford and J. W. Wrenn, both of San Francisco.

Active members only were admitted to the meeting held Thursday night when H. H. Walker of Los Angeles was elected president of the California Electragists. He will retain his present position as chairman of the southern division. C. F. Butte of San Francisco, was elected state vice president and chairman of the northern division. Edward Martin, of San Francisco was elected secretary of the northern division.

The executive committeemen of the northern division are: C. F. Butte, San Francisco; Edward Martin, Victor Lemoge, H. H. Courtright, Fresno; and Clyde L. Chamblin of San Francisco.

The executive committeemen of the southern division are: H. H. Walker, Los Angeles; Frank McGinley, Wilm-

ington; F. E. Elser, Los Angeles; J. J. Farley, Fullerton; and J. F. Zwiener, San Diego.

The entertainment provided the delegates was especially interesting. Thursday afternoon the ladies were taken on an automobile tour up the coast as guests of the Arcata Chamber of Commerce. Friday morning the delegates and their wives visited the electric mill of the Dolbeer and Carson Lumber Company. They then drove to the Holmes Eureka Lumber Company's woods near Carlotta where they sat down to a lumberjack's dinner and later visited the logging woods.

The ball was held Friday night. Golf enthusiasts of the convention held their tournament Saturday morning and at noon the delegates were served lunch at Sequoia Park as guests of the Eureka Chamber of Commerce. Shortly afterwards the baseball game between jobbers and manufacturers and the Electragists was held. The Electragists redeemed themselves in a splendid manner after their defeat at Santa Cruz last year by easily winning the game.

Banquet Concluding Function

The three day convention was concluded Saturday night with a banquet at the Eureka Inn. Arthur Dahl, chairman of the golf committee, presented the Manning-Bowman trophy for the ladies to Mrs. C. B. Kenney, and the East Bay Electragists trophy to L. Siebert.

C. B. Kenney, captain of the Electragists baseball team gave credit for the winning of the game to the Electragists of Humboldt County.

Then newly elected officers of the asso-

ciation were introduced by the retiring president, and Mr. Walker, the new president, after outlining the policies and plans he hopes to carry out during his administration, called on C. B. Kenney who paid a fitting tribute to Victor Lemoge for his work for the Electragists and the industry and presented him with a gift from the members.

Following Mayor A. W. Way of Eureka, was the dancing, which was enjoyed during the remainder of the evening. The welcome and hospitality of the Electragists and other people of Eureka and Humboldt County was an outstanding feature of the convention.

Denver Has Record Outing

Contractors and dealers in Denver took an active part in the preparation and staging of the fifth annual picnic of the Electrical Co-operative League in that city on August 6. It was the occasion of the annual midsummer holiday of the electrical family of the city and nearly all of the firms closed for the afternoon.

Reports from Denver indicate that the affair was a record breaker in more ways than one. In addition to the large crowd there was a greater number of prizes than at any of the previous picnics. All of the prizes for the picnic were contributed by members of the league and friends outside of the industry, according to S. W. Bishop, league manager, and ranged from a flashlight to a washing machine.

The committees were headed by E. P. Kipp, Clarence Keeler, K. L. Francis, A. E. Bacon, and W. R. Kaffer.



Some prominent Denver electragists are included in this group of advisory board members of the Electrical Co-operative League who staged the recent picnic of the organization and who were lined-up preparatory to a stunt of their own viz., determining the loudest and best laughter. They were lined up in front of a grandstand of 1,500 people. Reading, left to right, O. L. Mackell, John J. Cooper, Ernest P. Kipp, E. C. Headrick, mountain division executive committee man of the A. E. I., A. E. Bacon, F. F. McCammon (who won the event), W. R. Kaffer, electragist, K. L. Francis, A. C. Cornell, chairman of the league, D. D. Sturgeon, electragist, S. W. Bishop, league manager, L. M. Cargo, V. N. Garretson, and W. A. J. Guscott, president of the Denver contractors' association and Colorado electragists' group and former chairman of the league.

More Time for McGraw Awards

The closing dates for the filing of entries for the James H. McGraw Awards for Electrical Men have been extended to provide a little more time in which contestants may present their suggestions. There are to be four awards—a Manufacturer's Medal, a Jobber's Medal, and a Contractor-Dealer's Medal and also a Medal for Cooperation which is open to officials or employees of any central station, manufacturing, jobbing or contractor dealer organization or of any local electrical league or national electrical association of the United States or Canada. In each case a purse of \$100 in gold will be awarded with the medal.

The manufacturer's, jobber's, and contractor-dealer's awards will be presented to the man who during the year 1924 made the most constructive contributions to the commercial development of his own particular branch of the industry. The medal for cooperation will be awarded to that man who has done most to promote cooperation and harmony between any two or more branches of the electrical industry within the same period. These awards will hereafter be made annually.

September first had been the time set for the closing of the contests for each award, but to provide more opportunity for the discussion of the awards and the presentation of entries, the closing date for the Contractor-Dealer's Medal will be September 15, just in time so that the presentation of this award may be made at the convention of the Association of Electragists, International at West Baden Springs, Ind., on September 24.

Full information as to these awards may be obtained by addressing the James H. McGraw Awards in care of the Society for Electrical Development, 522 Fifth Avenue, New York City.

Camp Co-operation

Advanced reports received by the Society for Electrical Development indicate an attendance at Camp Cooperation, September 8-12, which will tax the capacity of Association Island.

The first two days will be given over to a discussion of league operation and the other two days to specific activities such as the uniform electrical ordinance and the Red Seal Plan.



Hard Working Business Men—Prior to addressing 75 electrical contractors, jobbers and manufacturers after a dinner at the City Club of St. Louis on August 11 on the Association, Joseph A. Fowler, president of the Association of Electragists, put himself in trim with a round of golf at the Sunset Hill Country Club with Fred B. Adam of St. Louis. Fred's hand is not deformed. He is simply wearing a golfing glove.

To Draft Standard State Mechanics' Lien

The appointment by Secretary of Commerce Herbert Hoover of twelve qualified men as a committee to draft a standard State mechanics' lien act is announced in a statement issued by the Department of Commerce. At the request of several national organizations, the Department has undertaken to prepare an act suitable for adoption in the different States.

Mechanics' lien laws provide that contractors, subcontractors, mechanics, laborers, architects, material men, and others have contributed toward the construction of a building may obtain a lien on the property if they are not paid for their services within a reasonable time. The owner of the property then has to pay promptly or allow his property to be sold by the court to settle the claims.

The State laws vary greatly and therefore cause confusion and expense to organizations doing business in several States, and to workers who move from one State to another. Dissatisfaction has been aroused in a number of States by laws whose provisions are said to be unfair to one or more of the different groups concerned, or to be difficult to construe.

In order to frame an act which will

be as fair as possible to all the different groups it was felt that they should be represented in deciding on the general principles to be embodied in the act and that the best possible legal advice should be obtained in connection with phrasing it. The committee that Secretary Hoover has brought together accordingly includes representatives of the principal groups including some whose interests are those of the owner.

Super Power Radio Laboratory

A super power radio broadcasting laboratory for research on wavelengths from 5 to 3,000 meters with power from 5 watts to 100 kilowatts has been constructed by the General Electric Company on a 54-acre plot, two miles from Schenectady.

There are three 300-ft. towers, one of 150 ft. and a number of smaller ones ranging in height from 60 to 100 ft. Between them will be strung the different net works of antennae from which the company's engineers hope to secure fundamental data on the most efficient antenna for a given wave length and power.

It is also hoped that the experiments will show whether or not super power radio will break down static, overcome fading and increase the distance of reception, all without discomfort to the listener.

The first experiments during the last week in July were very successful.

Milwaukee Men Have Two Fine Outings

The spirit of good fellowship was decidedly manifest in Milwaukee this summer when two outings of local electrical men were held, one on June 16 and the other on July 23.

The first was a joint stag meeting of the Electrical Contractor Dealers' Association with the jobbers and utilities. As a preliminary to a chicken dinner, the contractors showed the others in the industry how to play ball to the tune of 29 to 5.

After dinner some excellent talks were made by H. M. Schmittbauer of Julius Andrae Company; Perry Boole of G-Q Electric Company, Harold Schwind of Moe-Bridges Company, Messrs. Kruse and Christopherson of

the central station and E. H. Herzberg chairman of the Contractor Dealers' Association.

The other outing was the second annual affair of the Milwaukee Electrical Industries and was attended by five hundred adults and three hundred children.

There were numerous amusements and sports and again the contractor-dealer team was a winner.

Reports from Milwaukee state that it was by far the best ever. The committee in charge were: Charles Krech, general chairman; E. J. Ensweiler, John Beyer, E. G. Ehlenbach, Harry Wnentkowski, Hans Tholen, R. H. Grobe, Walter Frank, H. Schwind, Perry Boole, A. C. Schultz, Pete Sprecher, Nels Christopherson.

New Electragists

The following list of contractor-dealers have made application for membership and been accepted into the Association of Electragists since the publication of the last list in the August issue:

IDAHO

Kellogg:

The Light House.

Wallace:

Northwest Light & Water Co.

MONTANA

Billings:

Billings Elec. Supply Co.

Bozeman:

D. H. Budd Company, Inc.

Livingston:

Electric Supply Company.

NEW YORK

New York City:

J. Livingston & Company.

NORTH DAKOTA

Fargo:

Farm Engineering Co.

SOUTH DAKOTA

Huron:

Robert Berndt.

Pierre:

The Electric Shop.

WASHINGTON

Spokane:

H. D. Alton.

Brown-Johnson Company.

Duncan Electric Co.

Maxwell & Frank.

Inland Electric Co.

Tinling & Powell.

Wenatchee:

Electric Service Company.

WYOMING

Sheridan:

Wyoming Electric Supply Co.

Contractor Dealer Notes

Elliott Brothers Electric Company of Shreveport, La., have recently secured a number of church and other jobs. They report as follows: Kings Highway Christian Church, \$2,000 including fixtures; Presbyterian Church, \$10,000 including fixtures, and Scottish Rite Cathedral, \$3,000, all of Shreveport. In addition, they have secured the wiring contract for the Nakotosh Hotel at Natchitoches, La.

A. B. Blake, electrical contractor and dealer of Wilmington, N. C., has moved his place of business from 109 Princess St., into larger quarters at 130 Market St.

C. A. Heisler has opened the Heisler Electric Shop at 330 Bond St., Asbury Park, N. J., carrying a line of electrical appliances and radios.

T. U. Singleton and Odell Small have gone in partnership in a combination electrical and plumbing business with headquarters in the D. C. May Building, Durham, N. C.

Ben Bishop, for several years with the San Joaquin Light & Power Corporation, has bought the Bishop Electric Company, with offices in the Hansen Building, Corcoran, Cal., where he will handle appliances and engage in installation work and motor rewinding.

W. G. Meuser has found it necessary to move into larger quarters at 9328 Grand River Avenue, North Grand River, Mich. In his new place he will have a fully equipped repair shop also.

The Moody Electric Company of Springfield, Ill., has changed its name to the Striffler Electric Service Company.

The Consumers Electric Company of Carthage, Mo., has been purchased by W. F. Barnett, formerly of Berkebile Electric Supply Company of the same city.

Avery S. Keller and Stewart O'Rear have opened a new electrical fixture store in Aberdeen, S. D.

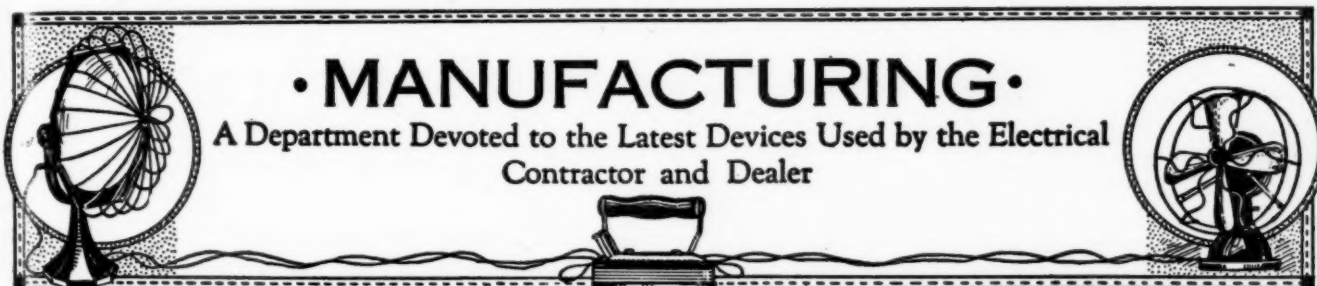
Dooley Brothers, electrical contractors, have moved their headquarters from Avon to Livonia, N. Y.

J. M. Maxwell & Son of Reading, Mass., have opened a branch store and contracting business in Medford. The parent company was established by the senior Mr. Maxwell 30 years ago.

Carney Chess and Albert Owens of Terre Haute, Ind., have opened an electrical lighting fixture business in Miami, Fla. Mr. Chess has been prominently identified with local Terre Haute contractor-dealer association work for many years.



Learn About New Wiring System—One hundred and thirty-one contractors were guests of the C-Q Electric Company of Milwaukee at dinner on August 4 to hear A. L. Atkinson and J. O. Wetherbie of the Bridgeport works and W. H. Coleman of the Chicago office explain in detail the new G-E Wiring System. The meeting aroused a great deal of interest and discussion.



Metal Back Plate Outlets

Harvey Hubbell, Inc., Bridgeport, Conn., have recently put on the market a new line of Porcelain Outlet Receptacles for use with either 3-1/4 or 4 in. outlet boxes, on metal ceilings and concrete or tiled walls.

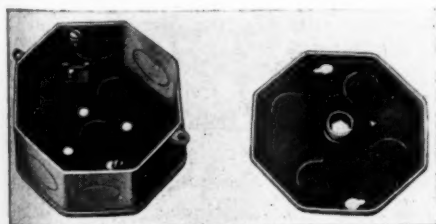


The important feature of these receptacles is the metal back plate designed to take either a round outlet box for conduit or the flat type cable box with fixture stud.

These receptacles are made in the pull type with 6 ft. of cord or with 8 in. insulated chain and in the keyless type.

Outlet Box for Concrete Construction

Improvements have been made in the line of "Union" outlet boxes manufactured by the Chicago Fuse Mfg. Co.,



15th and Laflin Streets, Chicago, for use in buildings of concrete construction. These boxes are provided with flanged back cover plates which can be removed, and after the required number of knockouts have been taken out the conduit can be attached and the box nailed to the wooden form. After the concrete has been poured and allowed to set, the wooden form can be torn

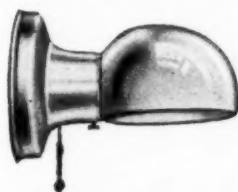
away, the openings in the box affording easy access for fishing wires through the conduit.

The boxes are octagonal in shape, six sides having 1/2-in. knockouts, and two sides which are directly opposite one another having 3/4-in. knockouts, so that the main line wires can be run straight through and the branches can be fanned out to the 1/2-in. conduit. Wiring is made easy by this arrangement and by the roominess of the box.

One type of back cover plate has five 1/2-in. knockouts, and four holes untapped for standard fixture studs, while the other type has four 1/2-in. knockouts and a fixture stud, the latter being made an integral part of the box by a special process.

Porcelain Bracket

Quadrangle Manufacturing Co., 553 West Monroe St., Chicago, Ill., is marketing a new porcelain enamel side wall bracket for use in corridors, stairways



and washrooms. Standard color is white, but colored or tinted porcelain finishes may be had on special order. The device is catalogued at No. 527.

Westinghouse 1925-27 Catalog

The Westinghouse Electric and Manufacturing Co. is distributing its new 1925-27 Catalogue of Electrical Supplies. The catalogue presents a complete representation of the apparatus manufactured by the Westinghouse Company, or obtainable through its district offices or agent jobbers, and gives detailed information on electrical supplies.

The publication which contains 1200 pages and is profusely illustrated.

New Radiotrons and Rectrons

The Radio Corporation of America announces the introduction of three new types of Radiotrons designed especially for audio-frequency amplification and two new types of rectifier tubes to be marketed under the trade-name "Rectron" for use in devices for obtaining filament grid and plate voltages from A. C. lighting circuits. None of these tubes supersede the present five standard types of Radiotrons but occupy special fields.

UX-120 is a new dry battery amplifier tube designed to provide increased loud speaker volume and improved quality of reproduction from dry battery operated sets.

UX-112 has been developed to meet a demand for increased loud speaker volume and improved quality of reproduction from radio sets operated by storage batteries, where UV-201-A is now used in the last audio stage.

UX-210 is a super-power amplifying tube designed to produce loud speaker volume considerably in excess of that obtainable with present types of tubes and to give undistorted output at such volume. Exceptional long life is claimed for it and also such characteristics that it may also be used for amateur radio transmission.

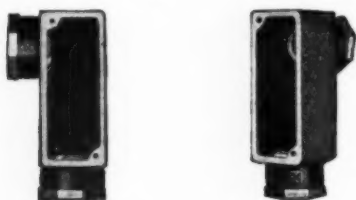
UX-216-B is a high power (60 milli-ampere output) single-wave rectifier, a new development which will be employed in the new rectifier-amplifier units for the operation of high power loud speakers.

UX-213 is a double-way rectifier giving outputs of approximately 50 milliamperes.

UX-874, UV-876 and UV-877 are tubes of a special type for regulation of line voltage, plate voltage and for protection of the plate circuits in certain new additions to the Radiola line to be announced in the near future.

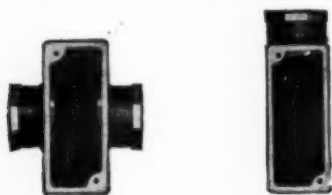
Threadless Conduit Fitting

The Erie Malleable Iron Company of Erie, Pa., announces a new type of threadless malleable iron conduit fitting, trade-named Kondu-Box, for which great economy of installation is claimed. A complete line of these fittings, both round and oblong, are in production. The distinctive merit of the Kondu-Box fitting is the fact that it



grips the conduit securely by means of a tapered bushing, thus eliminating the cost of thread cutting and the labor of screwing the conduit into place.

A case hardened bushing, having tapered threads for a lock nut and a tapered base, is the special feature of Kondu-Box design. This bushing takes a parallel grip on the conduit, due to its tapered thread being balanced by a slight taper on the interior of the body in which it seats; the grip is reinforced, and a perfect running ground secured at the same time, by means of sharp ridges or rings on the interior of the bushing. These ridges are forced through the enamel and cut into the conduit when the



lock nut is tightened. A slot in the bushing is so arranged as to have a band brake action which serves as an effectual lock against loosening by vibration and requires a minimum amount of effort to grip the conduit properly.

Residence Type Panelboard

The Westinghouse Electric & Mfg. Co. has announced a new residence type panelboard, designed for residences, stores and apartment houses, or any place where a simple and compact unit is necessary. There are two types—Type R which is for the two wire system, double fused for 4-6-8-10 and 12 circuits, and Type NR which is for the three wire system, single fused for 4-8 or 12 circuits.

The panel board is equipped with ample wiring space and plenty of knock-outs for any condition of wiring. In addition it has a distinctive feature in the design of the fuse block unit which is built of sections so assembled that it can be quickly removed from the box. This obviates the need of having the panelboard in the box while the conduits are being installed. The panelboard may be left out of the box until the plastering is finished and the wires pulled.

Candle Tumbler Socket

The tumbler switch is being applied by the Arrow Electric Company, Hartford, Conn., to candle sockets, which now gives them a complete line of candle sockets—pull, keyless and tumbler.



The new socket is listed as No. 4040 and is furnished with a 4½-in. finished tubing slotted to fit to the tumbler. Attention is also called to the hickey which is easily loosened and swiveled, so that the operating key is in the proper position and then tightened.

The Union Metal Manufacturing Co., Canton, Ohio, has recently opened a district office at 237 Central Arcade Building, Miami, Fla., to handle the sale of Union Metal Lighting Standards in Florida. This office is being operated under the name of The Florida White Way Illuminating Company, Inc., and is in charge of Frank E. Filer and C. A. Williams.

Central Tube Company, Pittsburgh, Pa., offers through an interesting series of folders the story of the manufacture of pipe and conduit from skelp to the finished products. In each folder a different operation is illustrated and described.

E. B. Latham & Co., New York City, are distributing their new catalog, No. 50.

Penn Junior Polarized Safety Panel

The Penn Electrical & Mfg. Co., of Irwin, Pa., have just placed on the market a line of safety panels which embodies the new polarized single pole solid neutral construction now permitted by the Underwriters. There are a number of decidedly new features to these panelboards and the line includes in addition to the ordinary fused-only type, panels which have single pole tumbler switches and fuses in the



branches. One unique point about these switches is that while they are single pole they are constructed with two blades in multiple giving a perfectly balanced strain on the moving parts, a quadruple break and double carrying capacity. Each blade has a carrying capacity of 30 amp., giving a total carrying capacity of 60 amp. for the switch. These panelboards are very compact and finished complete with flush type steel cabinets and packed in paper cartons to be stocked by the jobber.

"Planning and Judging Street Lighting," bulletin GEA-66 of the General Electric Company, Schenectady, outlines plans for different types of street lighting installations. It offers recommendations for the proper intensity of illumination for different classes of streets, and considers the different factors used in judging the worth of a street lighting system.

George V. W. Ingham, for the past three years Eastern sales manager of the Johns-Pratt Company, has resigned and is now located at 41 East 42nd Street, New York City, where he is considering the matter of serving as a special manufacturer's agent in the Eastern territory.

According to a statement issued by the Westinghouse Electric and Manufacturing Co., orders received for the quarter ending June 30 last, totalled \$44,432,200, as compared with \$40,031,000 for a similar period in 1924.